Medical Library

MAR 29 1929

VOLUME 9 NUMBER 3

ARCHIVES OF
OTOLARYNGOLOGY

EDITORIAL BOARD

GEORGE E. SHAMBAUGH, Chicago

ISIDOR FRIESNER, New York CHEVALIER JACKSON, Philadelphia

EUGENE A. CROCKETT, Boston ROBERT C. LYNCH, New Orleans

GREENFIELD SLUDER, St. Louis (Deceased)

MARCH, 1929

PUBLISHED MONTHLY BY AMERICAN MEDICAL ASSOCIATION, 535 NORTH DEARBORN STREET, CHICAGO, ILLINOIS. ANNUAL SUBSCRIPTION, $6.00

Entered as Second-Class Matter, January 14, 1925, at the Postoffice at Chicago, Illinois, Under the Act of March 3, 1879. Acceptance for mailing at special rate provided for in Section 1103, Act of October 3, 1917, authorized January 22, 1925

CONTENTS OF PREVIOUS NUMBER

FEBRUARY 1929. NUMBER 2

The Physiology of Vestibular Nystagmus. A. C. Ivy, M.D., Chicago.

The Modified Radical Operation on the Mastoid. Clarence H. Smith, M.D., New York.

Multiple Primary Carcinomas of the Larynx and Esophagus: Report of a Case. Dwight L. Wilbur, M.D., Philadelphia.

The Incidence of Nasal Sinusitis with Diseases of the Ear: One Hundred Cases in Children. Edmund Prince Fowler, M.D., New York.

Gradenigo's Syndrome. Samuel D. Greenfield, M.D., Brooklyn.

The Bony Labyrinth of the New-Born Infant and of the Adult: A Comparative Study. G. E. Tremble, M.D., C.M., Montreal.

A Comparison of the Outlines of the Frontal Sinus in Vivo as Shown by Transillumination and the Roentgen Rays. George Fetterolf, M.D., Sc.D., Philadelphia, and Edward E. Sprenkel, M.D., Jenkintown, Pa.

Clinical Notes:

The Treatment of Acute Infections of the Middle Ear and the Prevention of Mastoiditis. Adolph I. Schwartz, M.D., New York.

Progress in Otolaryngology. A Summary of the Bibliographic Material Available in the Field of Otolaryngology from October, 1927, to October, 1928: Anatomy and Physiology of the Ear. Philip E. Meltzer, M.D., Boston.

Abstracts from Current Literature.

Society Transactions:

Chicago Laryngological and Otological Society.

College of Physicians of Philadelphia, Section on Otology and Laryngology.

Directory of Otolaryngologic and Ophthalmologic Societies.

COPYRIGHT, 1929, BY THE AMERICAN MEDICAL ASSOCIATION

ARCHIVES OF OTOLARYNGOLOGY

VOLUME 9 MARCH, 1929 NUMBER 3

LARYNGEAL CANCER

EARLY DIAGNOSIS AND TREATMENT*

JOHN EDMUND MACKENTY, M.D.

NEW YORK

Malignant disease of the larynx occurs in 5 per cent of all malignant tumors and may be classified as follows: carcinoma, 98 per cent; sarcoma, 2 per cent. Of the carcinomas, 96 per cent are squamous cell and extremely malignant, varying considerably in degree; 2 per cent are basal cell carcinoma, 1 per cent papillary carcinoma and 1 per cent adenocarcinoma. The last three types are less malignant than the squamous cell carcinoma.

From a surgical and prognostic standpoint, the exact location of cancer in or about the larynx is of extreme importance. Clinically, the three recognized classifications, based on the location and on the extent of the disease, are: extrinsic, intrinsic and borderline intrinsic.

Extrinsic cancer rarely gives warning of its presence until well advanced, since cancer is a painless disease in this situation prior to the late ulcerative period, and since it does not at first alter the voice. Its early discovery is usually accidental. When incipient, it may be attacked surgically with a small percentage of cures. When advanced, it is a question whether or not surgical intervention is justifiable. In extrinsic cancer, lymphatic involvement is almost synchronous with the inception of the disease. Growth and extension through the lymphatics are rapid.

In 90 per cent of the cases intrinsic cancer gives immediate notice of its presence in a hoarse or altered voice. At first, it is usually slow in growth, and is located on or near a vocal cord, frequently in its anterior two-thirds. When incipient, it is well localized. Cervical lymphatic involvement rarely occurs until the disease has reached the arytenoids, has extended upward toward the rim or has perforated the anterior angle of the thyroid cartilage. Surgical intervention gives brilliant results if sufficiently radical and if applied before cervical lymphatic involvement occurs.

Borderline intrinsic cancer is advanced intrinsic cancer, yet it gives some hope of cure by surgical procedures. Favorable points in intrinsic

* Submitted for publication, Dec. 11, 1928.

* Read before the Chicago Laryngological and Otological Society, Chicago, Oct. 1, 1928.

borderline cancer are: Slow growth, superficial growth, slight or questionable involvement of arytenoids, extension downward and forward rather than upward and backward, absence of palpable glands, and low degree of malignancy (determined by relative number and arrangement of the epithelial elements and by the type of growth).

Intrinsic incipient laryngeal cancer is of chief concern, since extrinsic cancer usually is seen too late and treatment is generally hopeless even in the early stage, and since late intrinsic cancer (borderline intrinsic) should occur only when the patient fails to seek advice or the physician fails to understand the condition.

I would like to emphasize the fact that persistent, progressive hoarseness in or after middle life may, and often does, mean that laryngeal cancer is present; and it necessitates careful, conscientious and intelligent investigation by a competent observer. It is difficult to understand why this evident danger signal is so frequently overlooked by both the patient and the physician. In no other situation in the body does cancer give such early or such easily recognizable warning of its presence.

Given this warning, what must one look for and how may one differentiate incipient cancer from other diseases of the larynx?

Other laryngeal diseases causing hoarseness are:

1. Simple chronic inflammations: Simple chronic inflammation secondary to chronic tonsillitis, sinusitis, infected teeth, chemical irritants, tobacco, alcohol, excessive use of voice, etc. (Under this heading may be placed hyperkeratosis, pachydermia laryngis and the rare chronic, hyperplastic inflammations which are little understood and which often progress to obstruction and even death.)

2. Specific chronic inflammations: Syphilis, rhinoscleroma, tuberculosis, tuberculoma, leprosy.

3. Benign neoplasms: Papilloma, angioma, fibroma, singer's nodes, etc.

4. Paralyses; the most commonly seen are: Abductor, adductor, myesthenia aphonia and hysterical aphonia.

5. Prolapse of the ventricle of the larynx.

The triad, cancer, syphilis and tuberculosis, are constantly requiring differential diagnosis. A careful clinical history is invaluable in directing a search in the most probable direction.

In looking into the larynx, the following points must be noted: the position, size and characteristics when a growth is present; the extent, location and peculiarities if an inflammation is observed.

Cancer usually appears on the middle third of one cord, never on both simultaneously. The growth is usually forward, downward and outward or laterally, more rarely backward and upward. When incipient, the growth is well localized. Ulceration, pain and dysphagia are late occurrences. Immobility of the affected side usually occurs early unless the cancer is very superficial.

Tuberculosis usually begins in the interarytenoid space and on both arytenoids. Growth, as a rule, is confined to the posterior part of the larynx, and is bilateral and symmetrical. A pale edema is apt to appear over the involved area. Ulceration, pain and dysphagia occur early. Immobility of the cords is rare and develops late in the disease.

Syphilis, as a rule, involves the whole interior of the larynx in varying degree. It may simulate chronic laryngitis or may resemble chronic laryngitis on one side of the larynx and a neoplasm on the other. It may simulate exactly a malignant condition, but its development is more rapid, more irregular and more diffuse. Ulceration occurs earlier than in cancer, and pain is frequently absent even in the advanced stage. It yields unmistakably and promptly to treatment (therapeutic test).

In the larynx, tuberculosis is a painful disease. Syphilis is an anesthetic disease. Cancer is painful only when ulcerating, and then much less so than tuberculosis. Other laryngeal diseases are painless.

Benign neoplasms show a linear demarcation from the surrounding tissues, except tuberculoma, which has an inflammatory aureola. Cancer blends with its surroundings. In cancer, there is no distinct line of demarcation between normal and neoplastic tissue, as is seen in benign growths. All signs of inflammation are absent unless cancer is grafted on syphilis or chronic laryngitis.

The inflammatory group of diseases are characterized by diffuse thickening and discoloration of the entire larynx.

Tuberculosis is prone to occur in the posterior part of the larynx and is bilateral. It is, in my experience, always secondary to tuberculosis of the lung. Syphilis may occur in any part of the larynx and is diffuse. It is often difficult to differentiate from cancer. At times one must resort to the therapeutic test and to biopsy. Incipient, intrinsic cancer is always unilateral; it usually begins on or near the middle third of one cord and is noninflammatory and infiltrating. It cannot be too strongly stressed that a positive Wassermann reaction does not exclude cancer, nor does a negative reaction always exclude syphilis.

Under antisyphilitic treatment, syphilis recedes with unmistakable rapidity. If a laryngeal disease fails to so recede, syphilis as an entire cause must be excluded. If expert examination of the lungs fails to disclose latent or active tuberculosis, laryngeal tuberculosis may be excluded.

To summarize, early cancer must be suspected under the following conditions: the presence of progressive hoarseness, partial loss of the mobility of the cord on the affected side, occurring early in the disease, unilateral growth in the anterior two thirds of the larynx, patient of cancer age and negative reactions for syphilis and tuberculosis.

Biopsy is permissible if the diagnosis cannot be made otherwise, and if the patient demands it. If done, certain precautions are to be

observed. The patient should consent to operation if cancer is the ultimate verdict, and he should be metabolically and otherwise prepared for operation. Operation should follow biopsy as soon as possible. The tissue should be removed deeply in securing the specimen. A negative result at biopsy should not preclude positive clinical observations; even a positive result should be questioned if not backed by clinical evidence. In all cases, the opinion of two pathologists should be given.

TREATMENT

Pending the advent of a cure, acting perhaps through the control of cell metabolism, there is only one avenue of escape from cancer, and that is through surgical intervention sufficiently radical to circumvent the disease. However, all physicians are aware of the limitations of this measure.

If bodily activities are to proceed normally, the chemical balance of the cell and of the medium in which it is immersed must be maintained. When that balance is destroyed, the cell is unleashed and free to migrate. Cancer is the result.

I feel that cell life is activated by some great fundamental principle which, if discovered, would do for medicine, and particularly for cancer, what the discovery of the ion and proton is doing for chemistry and physics. Unhappily, in the present state of knowledge (or ignorance) one is concerned with the end-results without knowing how they are obtained. Ignorant of the processes of life, physicians are like the chemists of preatomic days, who, witnessing everywhere the phenomona of oxidation, did not know how or why oxygen combined to produce the result.

Unfortunately, in laryngeal cancer much must be sacrificed by the patient to attain a cure. Yet when one considers that death from this cause is the most distressing and revolting known to man, the price of immunity is not too great. The plight of the patient on whom laryngectomy has been performed is not so abysmal as is almost universally believed. My observation is that he pursues cheerfully his life's work and often with even a greater zest than before, since he never forgets that, through what he deems a miracle, he has escaped a horrible end.

It is gratifying that out of the chaos and conflict of the past is arising greater unanimity on the question of surgical procedure and on the true value of eradication.

In this field of medicine, as in other human endeavors, there is the world-old conflict between radicalism and conservatism, i. e., between those advocating total laryngectomy and those advocating laryngofissure. The use of total laryngectomy, advocated by the earlier surgeons, was discarded because of its defects, and gave way to the more conservative measure of thyrotomy or laryngofissure. A moderate surgical death

rate made this procedure popular for many years until a rehabilitated total laryngectomy, with low surgical mortality and an unprecedented percentage of nonrecurrences, asserted its superiority.

So here after seventy-five years of striving against the seemingly impossible, laryngofissure is the procedure employed for the very incipient, and total extirpation for the more advanced, stages of the disease. There is still considerable difference of opinion concerning the definition of incipient. If cancer could be diagnosed at its inception, there would be no place for the more radical operations. Laryngofissure would suffice. The first part of my paper is a plea for early diagnosis as an ideal attainment. Unfortunately, human acumen does not and never will reach this level of perfection; hence, one rarely sees the truly incipient case.

Even apparently incipient cancer may send out microscopic subsurface prolongations along the lymphatic channels to the furthermost confines of the larynx, in which event (and I believe that it is not uncommon) nothing short of total extirpation is of any avail. This condition is revealed only after the larynx is removed and carefully examined in the laboratory.

In 1923, I demonstrated three such extensions in early cases. The removed larynges were sectioned anteriorly and posteriorly to the tiny outcropping of cancer in the center of one cord, and cancer areas were demonstrated as far forward as the commissure and backward into the arytenoids. This knowledge places one in an uncertain position when advising the patient. He must be told that laryngofissure, though sparing a portion of his voice, is less certain to cure than total laryngectomy. One must also state that if the cancer recurs after laryngofissure has been performed, the chance of saving him by total laryngectomy is small. This possibility is increased if the more radical laryngofissure is done, since by this procedure the lateral wall of the thyroid cartilage is sacrificed, and thus the protecting barrier of cartilage between the disease and the tissue of the neck is removed.

It follows, therefore, that in the end the conviction is forced upon one that the more radical operation serves best in the great majority of cases, and that the less radical procedure of laryngofissure must be performed in the minority of cases until diagnostic skill and the patient's earlier awareness of his condition bring him under more immediate surgical control.

Total laryngectomy is one of the crowning achievements of surgery. Not so many years ago, the surgical mortality was about 50 per cent. Now, in expert hands, and with the many complications well controlled, one does not expect a surgical death rate of over 3 per cent. This percentage includes good and bad risks. This desirable result has been brought about by the coalescence of general and surgical knowledge and

skill on the part of the laryngologist. It is well known that the general surgeon has failed conspicuously in this field.

Two methods of removing the larynx claim attention, namely, the multiple-stage operation, and the one-stage or single-stage operation. I prefer the latter, and have, over a period of twenty or more years, striven to perfect its technic. Meticulous care must be used in every detail of preparation of the patient, in the operation and in the post-operative treatment. It is in overlooking the postoperative complications that failure is most liable to occur. The operative technic may be easily mastered, but the ability to anticipate postoperative complications and to obviate them promptly in their earliest manifestations is both an art and a science, which is acquired, as in other surgical fields, only after long experience.

It is to be remembered that not so many years ago the mortality following laryngectomy was almost prohibitive. Success has crowned efforts made in late years, because only intrinsic and borderline cases have been accepted for operation, bad risks have been rejected, and the principles that I have set down in a former paper have been followed. They are:

A careful study should be made of the patient's general condition and of the metabolism, especially as shown in the blood chemistry. Patients with pronounced and irremediable metabolic imbalance are rejected.

Digitalization should be employed just prior to the operation in all patients in whom cardiovascular degeneration is suspected.

Careful dieting and colonic lavage should be instituted for at least one week preceding the operation.

Mouth hygiene should be employed. The extraction of all diseased teeth and the treatment of diseased gums. Practically all mouths are unclean at the age at which cancer occurs. The entire absence of teeth is a distinct advantage.

The combination of local and general anesthesia should be used, the latter not to exceed one-half hour in time.

There should be absolute exclusion of blood from the trachea during operation, and of wound drainage after operation.

The placement of wound drainage so as to block off extension of the infection into the planes of the neck and the special management of this drainage during the convalescent period should be observed.

The trachea should be anchored in the lower angle of the wound, and corked to exclude wound drainage during the entire convalescent period.

Suction should be used for wound cleansing and for clearing the trachea of secretion. Inspissated secretions sometimes lodge at the

tracheal bifurcation causing serious embarrassment to respiration. These should be removed with the bronchoscope.

Naso-esophageal feeding tube extending only half way down the esophagus should be employed. This secures a liberal diet from the start.

The dressing and care of the wound should be done by the surgeon himself and not by an assistant or staff physician, probably untrained in this work. All one's experience in the handling of infected wounds is required in forestalling a serious septic invasion.

Through a radical operation, two patients with early cancer of the epiglottis have so far escaped recurrence, one for two years and the other for eight months. The operation included the complete removal of the larynx. Formerly, less radical procedures employed by me had resulted in complete failure.

The usual total laryngectomy was done with the following modifications: After the larynx and one ring of the trachea were skeletonized, the body of the hyoid bone was removed and the cross-incision, which exposes the thyrohyoid membrane, was deepened until this membrane was entirely visible; then the larynx, from below upward, was separated from the esophagus, the dissection being carried over the arytenoids to the posterior aspect of the true cords. At this point the esophagus was severed from the larynx by cutting across the remaining neck of tissue just in front of the arytenoids. The partly detached larynx was used as a lever to evert the epiglottis, the base of the tongue and the aryepiglottic folds into the wound. This was done by rotating the larynx forward and upward and the base of the tongue downward. This maneuver places these inaccessible structures practically on the surface and greatly facilitates a complete removal of the diseased area on a wide margin. The remainder of the operation was accomplished in the usual way.

In my experience, radium has been an utter failure for treatment in cases of squamous cell laryngeal cancer (i. e., in 96 per cent of laryngeal cancers). Its false promise is luring thousands beyond the aid of surgical procedures.

Surgical measures, applied early, give better results in cancer of the larynx than in cancer in any other part of the body.

PERSONAL EXPERIENCES

Since 1908, over 700 patients with cancer of the larynx have been studied. Eighty per cent of the cases were intrinsic and curable in their inception. Two hundred and thirty patients were treated surgically with a surgical death rate of under 3 per cent.

Recurrences in incipient intrinsic cancer occurred in 3 per cent of the patients after laryngectomy and in 35 per cent after thyrotomy.

Recurrences in intrinsic moderately advanced cancer occurred in 25 per cent; in borderline cancer, in 35 per cent, and in extrinsic cancer, in almost 100 per cent. (An exception to this must be stated. Two patients with early cancer of the epiglottis have had no recurrence after nearly two years.)

These statistics are an argument for early diagnosis and radical treatment.

Is cancer increasing? I fear that it is, at least in this particular field. A certain percentage of this increase may be accounted for by greater knowledge and alertness on the part of the medical profession. This fails, however, to account for the increased incidence of cancer in young persons, especially in women, and in old people. In my earlier experiences, cancer was limited almost entirely to the middle-aged; it is now common in persons in their thirties and even in their twenties, and it is not rare in persons between 75 and 80 years of age. Within eighteen months, I have removed the larynx from a man, aged 29, and from a girl, aged 20.

CONCLUSION

If the public mind could be oriented on one fact—that progressive hoarseness is a danger signal—and if the medical profession would urge a thorough and competent investigation of this danger signal; if the entire truth were told about radium, and if the laryngologist would heed the dictates of general surgical measures in the treatment of persons with cancer, i. e., radical removal, laryngologists would be doing their honest best with their allotted 5 per cent share of patients with this dire disease and would eradicate to a large extent the unspeakable misery attendant on uncontrolled laryngeal cancer.

ROENTGEN OBSERVATIONS ON SAFETY-PINS AS FOREIGN BODIES*

WILLIS F. MANGES, M.D.
PHILADELPHIA

The object in this paper is to show the kind of help that the roentgen department at the Jefferson Hospital gives Dr. Jackson and his associates in solving the problems connected with safety-pins as foreign bodies. The safety-pin causes approximately 12 per cent of the foreign body cases in Dr. Jackson's series.

DIAGNOSIS

The function of the roentgenologist is mainly diagnostic. This function involves not only the actual diagnosis of the presence or absence of the foreign body, but in positive cases, a description of the location of the safety-pin, its size, the distribution of its parts, its physical characteristics and conditions, its effect on surrounding tissues, the variation or progress from day to day when it is not removed immediately and the anatomic characteristics of the patient. After the pin has been removed, roentgenograms should show its absence and the condition of the patient. A negative diagnosis is never made without an excellent roentgenographic record of the entire alimentary and respiratory tracts.

In suitable instances, the double plane fluoroscope is of assistance in the removal of the foreign body.

The diagnosis in the majority of instances is suspected or inferred when there is a history of a safety-pin accident, but even then the diagnosis should depend on roentgen evidence, unless the safety-pin is visible in the mouth or pharynx on direct superficial examination. Even though the history is positive, instrumentation should not be resorted to without positive information concerning the presence and location of the pin, unless there is extreme suffering or suffocation threatens. One instance is known in which tracheotomy saved the life of a child in whose larynx a large, open safety-pin, had lodged and had escaped both clinical and roentgen diagnosis; however, it was later found by roentgen study. This case illustrates several other points: 1. Clinical study is insufficient in the absence of positive history. 2. Roentgen diagnosis should not be depended on unless the study includes the entire area of the alimentary and respiratory tracts, all clothing and other possible containers of foreign bodies having been

* Submitted for publication, Dec. 13, 1928.

* Read at the Eleventh Annual Meeting of the American Bronchoscopic Society, Washington, D. C., April 30, 1928.

removed. (The safety-pin aforementioned was seen by a roentgenologist during a fluoroscopic examination, but was thought to be in the clothing.) 3. Emergency measures are important in the presence of dangerous symptoms. This and many other cases particularly emphasize the wisdom and importance of Dr. Jackson's teaching: "Every ailing child should have a roentgen-ray examination to exclude foreign body." [1] Certainly, there need be no doubt as to the presence or absence of a safety-pin if the roentgen examination is comprehensive and efficient.

LOCALIZATION

Most types of foreign bodies have a tendency to lodge in some special part of the body. For example, the peanut kernel lodges in the bronchus, occasionally in the trachea; the watermelon seed usually stays in the trachea, but occasionally goes into the bronchus; the common pin penetrates into the depths of the lungs; the majority of coins, regardless of size, are found at the level of the suprasternal notch in the esophagus; the safety-pin, however, may lodge in any area of the alimentary tract from the pharynx to the rectum or in any part of the respiratory tract from the nasopharynx to the distal portions of the lungs. It has been found in patients from the age of 6 weeks to 46 years, and the sojourn has varied from one day to thirty-six years. No rule, however, even with regard to the age, is associated with a particular or special place of lodgment. Above the level of the larynx, the question of differential localization does not enter; below this level, however, the foreign body must be localized more specifically. Almost always, a safety-pin in the larynx or trachea is placed with its two branches in the sagittal plane, regardless of whether it is closed or open. Closed safety-pins have been seen obliquely disposed in the trachea, as have also open safety-pins in the upper part of the esophagus with the pin's two branches almost anteroposteriorly disposed; concerning the area from the level of the larynx to below the level of the bifurcation of the trachea, however, further data are necessary. The roentgenograms should always be of such quality as to show the shadows of the larynx and trachea in sharp detail, both anteroposteriorly and laterally. Then, if the foreign body is in the larynx or trachea, the shadow of it and of the larynx and trachea must coincide in both exposures. If the safety-pin is at the level of the bifurcation of the trachea or a little below it, it may be necessary to have the patient swallow some bismuth and water in order to establish the true location of the pin. A tracheal foreign body is apt to rotate when it reaches the bifurcation, so that an open safety-pin may

1. Jackson, Chevalier: Bronchoscopy and Esophagoscopy, ed. 2, Philadelphia, W. B. Saunders Company, 1927, p. 170.

present with its two branches disposed laterally, and therefore seem to be in the esophagus. I believe that most tracheal foreign bodies rotate when they leave the trachea to enter the bronchus. When the safety-pin is between the level of the bifurcation of the trachea and the diaphragm, and in the median line, one naturally knows that it is in the esophagus. When the foreign body is below the diaphragm, it is often necessary to resort to the bismuth test to ascertain definitely whether it is in the stomach or the intestines, and at times localization is difficult even with this test. As a rule, the air shadow in the stomach helps to establish the presence of the pin in the stomach. Beyond the pylorus, localization is not so much a matter of importance unless the safety-pin remains at any one spot for more than a few days; it should then be considered a menace that might require surgical intervention. In the event of surgical intervention, the operator should be guided to the exact location of the pin by fluoroscopy, without resorting to unnecessary manipulation.

SIZE AND DISTRIBUTION OF FOREIGN BODY

Next to localization, it is important to demonstrate the actual size of the pin and the distribution of its parts. To determine the size of a safety-pin in the body, a roentgenogram must be made at a distance of 36 inches (91.44 cm.) or more, in order to prevent undue enlargement of the shadow, and the pin must be parallel to the film in order to prevent foreshortening of the shadow. The exposure must be made in the tenth of a second or less to prevent the distortion of the shadow by the motion of breathing, which cannot be controlled in children. With a technically perfect roentgenogram, one can either make actual measurements of the shadow of the pin or, by putting other pins in contact with the shadow, select the one nearest the size of the shadow. By this method of comparison, which was adopted by Dr. Jackson, one can often determine the exact type of pin present, as well as its size, which in turn helps to solve the problems of removal. One should study the case fluoroscopically and predetermine the position of the patient that will give the most accurate record as to the size of the pin and the width of its opening, but one should not attempt to determine the actual size by means of the fluoroscope alone. If necessary, to obtain satisfactory roentgenograms, reexamination should be made.

In the manner of distribution of its parts, the safety-pin is the most variable of all foreign bodies which lodge above the diaphragm. With the two branches disposed anteroposteriorly, the pointed branch may be anterior or posterior, and the spring end may be upward or downward. With the two branches disposed laterally or, rather, in the coronal plane, the pointed branch may be to the right or left or above or below, and the spring end may be upward, downward or to either

side. The keeper branch may be in the median line with the point projecting laterally, or the pointed branch may be in the median line with the keeper end projecting laterally. These variations are as common when the safety-pins reach the bronchi as when they are in the esophagus or upper air passages.

COMMENT

I believe that the bronchoscopist should study the films with the roentgenologist in order to appreciate these variations rather than depend on a mere description of the situation.

At times it is impossible to determine how the safety-pin has arrived at its destination. It is believed that many of the cases in which the spring end is upward are the result of the gurgitation from the stomach and reverse peristalsis in the esophagus. One cannot conceive, however, how a large, widely open safety-pin, with the open end downward, could have its keeper in the bronchus of the right lower lobe and the pointed branch in the upper lobe. Fortunately, the solution of the problem in one such case did not have any direct bearing on the fortunes of the patient; it was a more or less fortunate situation for him because the removal was relatively simple as the spring, or the part which presented itself to the bronchoscopist, was uppermost.

The anatomy of the safety-pin varies somewhat as to the thickness of the wire, the size of the wings of the keeper, the size of the spring coil and, particularly, the size of the spring clamp. The real importance of being able to determine these points by means of roentgenograms is that it frequently enables one to select a duplicate and with it make experiments in manipulation before attempting the removal of the foreign body. One is usually able to determine from the roentgenogram whether or not the pin is defective. These are variations which may influence directly the method of removal. For instance, the bronchoscopist would not try to close a pin with a markedly bent or defective keeper or a markedly bent branch—two rather common defects. In one instance, I feel certain that the pin opened after it had been swallowed and in this way became a foreign body with the open end downward. The pointed branch was bent, and the extreme point was slightly defective. The extent of the spread is another important and also variable condition. The two branches may be in any relation, from parallel when closed to at a right angle with each other, and one beauty pin was even much more widely open or more nearly straight. There is no such thing as a true normal spread; however, one frequently resorts to the term "normal spread." One often marvels at the size of the pin and the extent of the spread which may be present.

There have been a few cases of multiple safety-pins. In one case, the pins were large, closed and linked together in the trachea. In

another case, it could be determined from the roentgenograms that four, large, open safety-pins were closely related to each other, but it could not actually be determined to what extent they were entangled until Dr. Jackson investigated with the esophagoscope.[2] He found that they were not only entangled by way of interlocking, but, further, that they were bound together by some wool or fabric. This, of course, could not be demonstrated by means of the roentgen rays alone.

In a few of the cases of long standing, it has been said that the pin was corroded and might easily break, but in this again one cannot be certain from the roentgenograms alone.

Roentgen examination is of importance in a specific way in bringing to light evidence of complications or injury to surrounding parts. More or less extensive swelling is frequently found in the deep cervical structures or in the periesophageal or pulmonary structures. Such complications are found in cases of recent occurrence rather than in cases of long standing, which is natural, because if the foreign body is not removed, the complications become fatal before the object remains for any great length of time. Puncture of the pharyngeal wall soon causes a retropharyngeal or peripharyngeal swelling that will give positive roentgenographic evidence. When the point penetrates the esophageal wall, there soon develops a more or less extensive mediastinitis or even pulmonary infection, either one of which is readily recognizable. The bronchoscopist should know of such complications before operation, if possible. Many of Dr. Jackson's cases are not primary when they come to him, and it is always difficult to determine how much injury has been done by previous instrumentation.

In cases of long standing, the safety-pin is usually in the bronchus, and the pathologic process in the lung around it is more or less extensive; information concerning this should be as exact as possible before operation.

In a recent case, I was impressed with the manner and extent of movement of the pointed branch that was in extremely close relation to the posterior wall of the heart.

Occasionally, one must try to differentiate between an enlarged thymus and mediastinitis. At times, this is impossible from a single observation; examination should be made from day to day as an infectious area will increase whereas a thymus will not become larger if it is uninjured. Then, too, there may be evidence of pulmonary reaction to an infection in adjacent structures.

If there is contraindication to immediate bronchoscopy, esophagoscopy or gastroscopy, daily roentgen observations should be made.

---

2. Jackson (footnote 1, page 253).

The safety-pin anywhere in the alimentary tract has a tendency to progress, and if it is below the diaphragm, it should be undisturbed rather than be sought by a novice. As long as it is in the stomach, it may be removed through the mouth; but removal should be attempted only after the most careful preparation, with instruments available to meet a variety of difficulties, and with a double plane fluoroscope handled by an experienced roentgenologist.

A safety-pin, beyond the pylorus, should be watched every day or at least every other day for progress. If it stops at any spot for more than a few days, a surgeon should be consulted, and at the first sign of peritoneal inflammation, operation for removal should be done under the guidance of the double plane fluoroscope. Dr. Jackson has pointed out that perforation is perhaps more apt to occur as a result of ulceration than from penetration of the intestinal wall by the pinpoint.

After foreign bodies have been recovered or have passed the alimentary tract, roentgen examinations are always made to show the absence of the foreign body and the condition of the patient. When a pathologic condition is present, the progress of this process is noted by repeated roentgen examinations.

At times the double plane fluoroscope is of considerable value in the handling of open safety-pins which are below the level of the larynx in the air passages or below the suprasternal notch in the alimentary tract. The roentgenologist should make the best possible preparation to have his apparatus in perfect order and to have his eyes well prepared for fluoroscopy. He should then realize the limits of his responsibilities as well as his abilities. He should give information only when he is certain of his observations. His problems are relatively simple, but they are easily complicated. His duty is to tell the bronchoscopist the relation between his tube or forceps and that portion of the foreign body which he wants to grasp. He must be certain that the point of the pin is either sheathed or trailing before traction is made. The fluoroscopist and the bronchoscopist should be able to understand each other's language as well as responsibilities. They should discuss a definite plan of procedure before starting and should work as quietly as possible, because the patient is near enough to hear. Patience and lack of hurry are essential. The roentgenologist must be careful to avoid overexposing the patient or any of the assistants.

The bronchoscopist must not expect undue help from the roentgenologist. The bronchoscopist must know whether he has tissue in the grasp of his forceps, as well as the pin, and he must be careful in making traction, even though he is told that the point is sheathed or trailing. In short, the roentgenologist is not responsible for failures or accidents over which the bronchoscopist has control.

"SUCTION MASTOIDS" *

J. COLEMAN SCAL, M.D.
NEW YORK

In the treatment for acute otitis media, prompt paracentesis of the drum-head is essential in order to produce adequate drainage and to ward off a possible involvement of the mastoid. This should be done with the patient under general anesthesia, preferably ethyl chloride, and a wide incision should be made in the postero-inferior quadrant of the drum. This procedure will keep the incision open as long as there is pus in the middle ear. Repeated incisions of the drum are not only unnecessary, but harmful, as the subsequent scarring and adhesions result in disturbed hearing during later life.

Many otologists use suction after paracentesis in an effort to free the middle ear from pus. In this way, an attempt is made to shorten the period of discharge and to prevent the development of mastoiditis. While this method of withdrawing pus into the suction tube is spectacular and gratifying to the parents, the end-results are deplorable. In all the cases that have come to my attention, I have found identical pathologic conditions.

Sonderman [1] was probably the originator of the suction method of treatment for acute otitis media. He expressed the belief that aspiration of the middle ear reduces the inflammatory condition and shortens the time of treatment and that, since the abscess cavity does not communicate directly with the antrum, suction has little effect on the abscess in the mastoid.

Kopetzky [2] disagreed with Sonderman and condemned the method emphatically. He pointed out that the use of suction in the acute stages distorts the clinical picture to such an extent that it prevents the proper judgment of the progress of the condition. An ear to which suction has been applied shows an edematous drum, and the mucosa of the middle ear is so congested and swollen that drainage is impeded. He also pointed out that suction may remove the symptoms without affecting the lesion. In such cases, the pain is relieved often, the temperature drops and the patient feels more comfortable; yet the condition in the middle ear advances steadily and is apt to produce intracranial or other complications.

---

* Submitted for publication, Nov. 12, 1928.

* From the Oto-Laryngological Department of Beth Israel Hospital.

1. Sonderman: Ueber Saugtherapie bei Ohrenkrankungen, Arch. f. Ohrenh **64**:15, 1904-1905.

2. Kopetzky, S. J.: Acute and Chronic Suppurative Otitis Media, Arch. Otolaryng. **2**:271 (July) 1925.

Dr. Joseph Beck [3] claimed excellent results with suction combined with dry treatment in chronically suppurating ears. He stated, however, that such treatment may be injurious in many ways if used unskilfully. He used capillary suction only, and advised that it be directly under the otologist's supervision. The part to be cleansed should be brought in contact with the capillary tube without causing any discomfort or resulting in any congestion of the parts.

Another otologist, Dr. E. R. Carpenter [4] of Dallas, Texas, used suction immediately after paracentesis and employed an ear tip large enough completely to close the external canal, allowing from five to fifteen points of suction. He asserted that he had never seen any damage from this treatment, but he failed to mention how many of his patients with acute otitis media developed mastoiditis.

When the ears of patients who have recently undergone suction treatment are examined, mastoid symptoms, marked pain and tenderness are seldom present, but deep pressure will generally elicit some tenderness over the mastoid process. The drum always looks intensely congested and edematous. Sagging of the roof canal is always present. The temperature varies from 98.5 to 103 F. X-ray examination generally shows a marked clouding of the mastoid process without destruction of the intercellular structures. Tests of hearing always show a marked diminution in hearing in the affected ear.

When these patients come to operation, they present atypical pictures in which nature has almost performed the mastoidectomy. The entire mastoid is found to be a mass of broken-down debris which can be removed easily with the curet. Most of these patients present either a perisinus or an epidural abscess.

The mechanism of the suction mastoid, as explained by Kopetzky [5] and Almour,[6] is the production of a negative pressure which results in a backflow of pus into the aditus and antrum. The free flow of pus from the antrum is obstructed by the resultant engorgement and swelling of the mucous membrane and capillaries.

Beck said that the injudicious use of the negative pressure on the tympanic membrane causes a hypertension which acts like Bier's treatment and produces a serous exudation from the tissues.

---

3. Beck, Joseph; Pollak, Harry S., and Lederer, Frances: Capillary Suction as an Aid in the Treatment of Ear, Nose and Throat Diseases, Laryngoscope **35**:402 (May) 1925.

4. Carpenter, E. R.: Laryngoscope **32**:864 (Nov.) 1922.

5. Kopetzky, S. J.: Otologic Surgery, New York, Paul B. Hoeber, 1925, p. 68.

6. Almour, Ralph: The Conservation of Hearing in the Suppurative Middle Ear Diseases of Childhood, M. J. & Rec. **120**:178 (Dec.) 1924.

REPORT OF CASES

Because of lack of space, only four cases of the typical "suction mastoid" are reported.

CASE 1.—D. D., a boy, aged 8 years, had measles and scarlet fever one year before admission to the hospital. The present condition dated back to four weeks before examination when the child complained of pain in the left ear. The temperature was 103 F., and there was pain behind the ear. The attending physician called an otologist who immediately incised the drum, thereby relieving the pain and reducing the temperature to 99.5. The child was then treated at the otologist's office where he received a daily treatment of suction and irrigation. The pain behind the ear gradually subsided, and the temperature continued to be 98.5 in the morning and 100 in the evening. The child felt almost completely well at the end of the second week and continued apparently well until the fourth week, when the mother noticed the left ear standing away from the mastoid and a marked swelling behind the ear.

On June 5, I first saw this child and on inspection could see the left ear standing away from the mastoid and edema over the mastoid. There was slight pain on pressure. The temperature was 100. Examination of the ear showed a reddish edematous drum with marked sagging of the roof canal. The perforation present at the lower posterior quadrant could barely be discerned. A roentgenogram was taken and showed a cloudy mastoid.

Mastoidectomy was performed four hours later, and the cortex was found ruptured. The mastoid showed extensive destruction, and was almost a large pus cavity. The lateral sinus was exposed almost through its whole course, and granulation tissue found over it was not disturbed. The blood clot method was used in closing the wound. The patient made an uneventful recovery, the ear being dry and the mastoid wound completely healed at the end of the fifth week after operation.

CASE 2.—M. L., a boy, aged 4 years, had an abscess of the left ear three weeks prior to examination. This was opened by an otologist and discharged freely. When the child went to the otologist's office, suction was applied to the ear. The child was comfortable and did not complain of pain over the mastoid until the end of the third week. At that time he began to have a temperature of from 100 to 101 F. in the evening, could not sleep and became pale. The discharge from the ear increased so much that the pillow was saturated at night.

On April 18, 1928, the child came to my office, and examination disclosed that while the mastoid region was not swollen there was a decided tenderness over the entire mastoid. The ear canal was filled with a thick, yellowish pus which under pressure and pulsation exuded through a perforation at the lower middle quadrant. The drum was bulging, edematous and grayish, and it met the sagging roof canal at a marked angle. A roentgenogram taken on April 14 showed a cloudy mastoid but not any destruction of cells. The mastoid was opened and found filled with pus and granulation tissue. The sinus plate was found to be necrotic and was removed, the lateral sinus thus being exposed up to the torcular herophili. The wall of the sinus was discolored and felt hard, but as pulsation was present, it was decided not to explore the sinus. The dural plate was found intact. The antrum was easily located and bled profusely because of the large amount of granulation tissue present. The mastoid wound was closed by the blood clot method. On April 24,

the child developed lobar pneumonia but made an uneventful recovery. The mastoid wound was healed and the patient discharged at the end of the sixth week after operation.

CASE 3.—I. V., a girl, aged 7, had measles and bronchitis five years before admission to the hospital. The present history dated back to five weeks before admission when the child complained of pain in the right ear. The ear was opened by an otologist and then treated with suction and irrigation for ten days. The child then commenced to have severe pain behind the ear, and twenty-four hours later the mother noticed a marked swelling behind this ear.

Examination on March 21, 1928, showed that the child was apparently not acutely ill. The right ear stood away from the head, and there was a slight amount of swelling and tenderness over the mastoid. Examination of the ear canal showed a copious discharge of pus with marked sagging and edema of the roof. The drum was swollen and angry looking, and a small perforation expelled pus with each pulsation. The temperature was 102 F.

Mastoidectomy was performed before roentgenograms could be taken. The usual incision was made, and a small perforation was found at the posterior tip. The abscess cavity was completely cleaned out, and the antrum was exposed and found filled with granulations. The pus could be seen issuing from the anterior zygomatic cells. A subdural abscess was located. The dural plate was removed, but the granulations were not disturbed. An uneventful recovery took place in four weeks.

CASE 4.—H. I., a girl, aged 17 months, presented nothing of importance in her previous history. The present condition dated back to ten days previous to examination when the child had a high temperature for three days. An otologist incised both drums, and there was a free flow of pus following the incisions. He then applied suction to both ears.

On March 7, 1928, examination disclosed a slight swelling at the junction of the lobe of the left ear and the left mastoid. The temperature was 103 F. The left ear canal was almost obliterated by the drooping of the roof canal. The drum was sagging and edematous. The right ear showed a swollen drum which was discharging freely, but the roof canal was not sagging.

The patient was watched for five days, and the symptoms did not abate. The temperature ranged between 100 and 103. Because suction had been applied, a double mastoidectomy was decided on. The mastoids were opened, and a small perforation was found in the left cortex. The mastoid cells were found to be necrotic at both sides and were easily removed. When the left antrum was opened, a gush of pus appeared, which was found to be coming from a subdural abscess. The dural plate was exposed, but only a small part was removed; the dura was not disturbed. Recovery was uneventful and the patient was well at the end of the sixth week after operation.

SUMMARY AND CONCLUSION

Paracentesis should be performed in all cases of acute otitis media. Repeated incisions of the drum are not only unnecessary, but are contraindicated. If signs of involvement of the mastoid persist after paracentesis, they are generally due to involvement of the mastoid through the lymphatics and contiguous tissue, and could not have been prevented in any way.

The fallacy of the application of suction in cases of otitis media purulenta acuta is seen easily. Most of these patients eventually come to operation, and there is always more or less loss of hearing because of the pathologic condition caused by the marked traction on the ossicular chain produced by the suction.

In the cases recorded, it will be noticed that in each either a perisinus or a subdural abscess was present.

Suction should never be applied to the ears.

44 West Seventy-Fourth Street.

ANGINA AGRANULOCYTOSIS*

JOHN B. POTTS, M.D.
OMAHA

Schultz,[1] in 1922, reported six cases of angina agranulocytosis, in all of which the disease was characterized by an acute infection of the mouth or throat, a low white cell count with a marked reduction or absence of the granular cells, high fever, great prostration and a rapidly fatal course, death occurring in from three to four days. All the patients were middle-aged women who had been in good health before the onset of this disease. The tonsils and pharynx were acutely inflamed and became ulcerated and covered with a grayish exudate. There was some enlargement of the cervical lymph glands, and the liver and spleen were enlarged in three of the patients. They were jaundiced but did not have any hemorrhagic spots.

Since this report, many more cases have been reported. In 1927, Kastlin made a careful review of the literature; he found forty-three cases reported and added two of his own. Of the forty-five cases, thirty-five were in females and ten in males. There were forty-two deaths and three recoveries. He questioned the diagnosis in one case in which the patient recovered, on account of the observations in the blood not being typical. Autopsies were performed in thirty-six cases. The heart, lungs, spleen, liver, kidneys and other organs did not show any characteristic changes, but the bone marrow was either poor or lacking in granulocytic cells. Ulcerative lesions occurred in other parts of the body but were always present in the mouth. They appeared in the stomach, duodenum, ileum, colon, anus, rectum, cervix and vagina, and on the symphysis, hip and conjunctiva.

The blood picture was characteristic, in that the number of white cells was greatly reduced and the granulocytes were disproportionately lessened in number and often entirely absent. There is a progressive loss of white cells each day, the cell count frequently falling to less than 1,000 and in one case to 200. Several counts were as low as 400 to 600.

Since this report, several other articles have appeared, bringing the total number of reported cases up to eighty-three. As is to be expected, there are some borderline cases and cases attributed to other causes which should be classified as agranulocytosis, and some classed as agranulocytosis which are probably some other condition. Dodd and Wilkinson[2] classified those cases that occurred in syphilitic patients who were receiving treatment with arsphenamine as due to arsenic poisoning. It may be that the syphilis, the arsenic or both are factors in lowering the patient's resistance, but it seems that a classification of the disease should rest on the evidence of arsenic poisoning. In angina occurring in a syphilitic patient who is receiving treatment but does not have arsenical poisoning, the syphilis should be disregarded when the disease is classified and come under the head of other diseases present.

In a review of the literature since Kastlin's report, I find thirty-three additional cases which, with my own and the two reported to me by Dr. J. J. Thomson, make

* Submitted for publication, Aug. 22, 1928.

1. Schultz, Werner: Deutsche med. Wchnschr. **53**:1213 (July 15) 1927; Klin. Wchnschr. **6**:2437 (Dec. 17) 1927.

2. Dodd, K., and Wilkinson, S. J.: Severe Granulocytic Aplasia of Bone Marrow, J. A. M. A. **90**:663 (March 3) 1928.

thirty-eight. Kastlin[3] reported forty-five, making a total of eighty-three. Of the thirty-eight patients, thirty-three died and five lived.

At a meeting of the Verein für innere Medizin on July 3, 1923, at the close of a lecture by W. Schultz, Dr. Friedmann[4] reported two, hitherto undescribed cases of malignant angina with a peculiar observation in the blood. In the meantime, he had been able to make observations on three further cases, so that including the Schultz case, the new disease had been observed ten times.[4] He described the disease as a gangrenous angina with high temperature and great prostration. The observations in the blood were characterized by a practically normal number of erythrocytes and a normal hemoglobin index. The number of lymphocytes was much reduced, with a total, or almost total, absence of the neutrophil leukocytes. In the bone marrow, the blood forming elements and neutrophil leukocytes were practically absent, while the other bone marrow elements, including even the sensitive thrombocytes and eosinophil cells, were present in normal numbers. All hitherto observed cases have speedily ended in death.

Soon after the onset, throat trouble appears, and a serious angina develops which in the beginning looks like diphtheria, but soon takes on the aspect of angina necroticans. In his fourth case, the throat trouble did not appear at once, but only later in the course of the disease; nor did the coating cover the tonsils, but it was spread only on the surface of the mucous membrane. In one case, the destruction proceeded even to the peeling out of the whole tonsil. Besides the angina, in some cases the upper part of the thigh, the finger and the labia showed ulcerations with a peculiar appearance.

The characteristic of the disease, however, is the blood picture. The scantiness of the leukocytes is conspicuous; in some cases they number less than 1,000. More conspicuous is the result of the differential count. The microscopic examination shows that the white blood cells consist almost entirely of lymphocytes. Either the neutrophil polymorphonuclear leukocytes are entirely absent, or only a few can be found by diligent search. Along with this, the other bone-marrow elements may be present in normal count. In his first case, considerable anemia was present, but in the other cases the number of erythrocytes was not reduced. Because of the small number of leukocytes, an exact count cannot be made of the monocytes, mast cells and eosinophils, but it is well to remark that in his fourth case eosinophil cells were found. The thrombocytes also were present in normal numbers in all patients examined.

The change in the blood picture consists, therefore, in the absence of the neutrophil leukocytes, an observation not hitherto encountered in any other disease. Observations on sections are not characteristic.

Dr. Rudolf Bantz[5] reported in detail two cases of angina agranulocytosis, although at the time he had not seen a report of this condition; in a footnote, however, he corrected his diagnosis after seeing Professor Friedmann's article.[4]

Dablin and Wahlgren[6] reviewed and analyzed forty cases in the literature and reported one case of their own. General reports of all their cases were as follows:

The course of disease was from three days to two weeks. The onset was acute with high fever and often chills. This was followed by an infection of the throat

3. Kastlin, G. J.: Am. J. M. Sc. **173**:799, 1927.

4. Friedmann, V.: About Angina Agranulocytica, Med. Klin. **19**:1357 (Oct. 14) 1923.

5. Bantz, R.: Med. Klin. **19**:1667 (Dec.) 1923.

6. Dablin and Wahlgren, F.: Acta med. Scandinav. **65**:407, 1927.

which progressed rapidly and assumed a gangrenous nature. The tonsils were always involved and in most cases the tongue and gums; in one case the larynx was involved. A number of patients showed vaginal ulceration. One recovery was reported. Three patients showed a slight increase in the size of the spleen and liver. Hypertrophy of the lymph glands was not present in any case.

The number of white blood cells ranged from 5,300 to 400, and consisted of lymphocytes, monocytes and an occasional polymorphonuclear. In the case of Leon,[7] which ran a course of two weeks, the white blood cells consisted of 91 per cent lymphocytes and 9 per cent monocytes. The red blood cells, in general, as well as the hemoglobin content, were practically normal. A few patients showed anemic tendencies. All patients had essentially negative throat cultures. One patient showed diphtheria bacilli, and one case pneumococcus bacilli. Spirochetes or fusiform bacilli were not found in any case; *Streptococcus hemolyticus* was found in one.

Death usually resulted from bronchopneumonia. Beneficial results were not obtained in any instance. One patient was given diphtheria antitoxin. Arsphenamine was used in every case.

Microscopic examination of the bone marrow revealed a marked diminution of the white blood cell elements. The red blood cell count and the large nucleated giant cells were normal. Lymphoid cells were present in large numbers and myeloblasts in small numbers. The lymph glands, spleen and liver did not show any characteristic changes.

An analysis of the author's case, which was typical of the disease, showed: red cells, 4,220,000; hemoglobin content, 84 per cent; white cells, 400 per cubic millimeter, all of which were mononuclears.

Von Haken[8] reported three cases, all fatal, occurring in children, aged 4, 6 and 8 years, respectively. Two had hemorrhages of the mucosa. An enlarged spleen was found in all three. The superficial lymph nodes were enlarged in two.

Hirsch[9] reported six cases and found forty-five in the literature, which with another just reported by Jaffé make a total of fifty-two. All six cases came to autopsy. He stressed three characeristics of the disease.

(*a*) General pathologic condition with a high temperature varying from 39 to 40 C. (102.2 to 104 F.).

(*b*) Marked necrotic angina, with necrosis of the oral mucous membrane.

(*c*) A peculiar blood picture—a marked leukopenia with a marked diminution of granulocytes.

He did not believe that the tonsils were the primary focus, but found that they became involved in most cases only after the patient had been under observation. In some cases, they remained entirely free.

In the differential diagnosis it was necessary to consider pernicious anemia, aleukemic leukemia, sepsis, kala azar and noma.

Schultz[1] reported one case, in a woman, aged 30. After sixty days, with several periods of remission, the patient recovered. A record of the treatment was not given.

Zikowsky[10] reported four cases—three deaths and one recovery.

---

7. Leon, A.: Deutsches Arch. f. klin. Med. **143**:118, 1923.
8. Von Haken: Deutsche med. Wchnschr. **54**:565 (April 1) 1927.
9. Hirsch, C.: München. med. Wchnschr. **74**:762 (May 6) 1927.
10. Zikowsky, Z.: Wien. med. Wchnschr. **77**:589 (April 30) 1927.

Ashworth and Maphi [11] reported one case. The patient had a complete physical examination six weeks previous to the illness. At that time, there was a complaint of nervousness, irritability, lack of endurance and menorrhagia. The hemoglobin content of the blood was 60 per cent; red cells, 4,000,000; white cells, 3,500. The attack of angina lasted three days, beginning with influenza. Examination of the blood on the day of death revealed: hemoglobin content, 60 per cent; red cells, 4,000,000; white cells, 160; small lymphocytes, 25 per cent; polymorphonuclears, 22 per cent; transitionals, 2 per cent; eosinophils, 2 per cent; basophils, 3 per cent; myelocytes, 5 per cent.

Finnigan [12] reported one case in a man. Examination of the blood revealed: red cells, 5,000,000; hemoglobin content, 73 per cent; white cells, 950; neutrophils, 13 per cent; eosinophils, 3 per cent; basophils, 1 per cent; small lymphocytes, 64 per cent; large lymphocytes, 11 per cent; transitionals, 1 per cent; large mononuclears, 7 per cent. Treatment consisted of the transfusion of 700 cc. of blood. The second day after the transfusion, the patient began to improve and went on to recovery. The blood count on Dec. 2, 1926, revealed: red cells, 5,400,000; white cells, 10,000; polymorphonuclears, 85 per cent; small lymphocytes, 15 per cent.

Hill [13] reported two cases which occurred after the removal of teeth.

Dr. J. J. Thomson of Mount Vernon, N. Y., furnished me with a report of two cases not yet published. The first case was that of a woman, aged 34. There was a previous history of sugar in the urine and increased blood sugar. She had had recurrent attacks of secondary anemia. The present acute attack began with a small ulcer on the mucous surface of the upper lip in the median line. Three days later (Feb. 23, 1928), ulceration appeared on the border of the tongue posteriorly; then the right tonsil and practically the whole throat and mouth became involved. She died on the sixteenth day.

Dr. Adolph Sachs [14] of Omaha reported one case which occurred during the same twelve months' period as the cases I am reporting. The disease ran a fulminating course, and the patient died on about the fourth day after the lesion in the throat developed.

Koehler [15] reported three cases of leukopenia showing the remarkable differences in the aspects of diseases of the blood. Two were cases of aplastic anemia-Ehrlich, and one was agranulocytosis.

Lauter [16] reported two cases, in one of which the patient recovered. The observations in the blood on the eighth day of the disease were: erythrocytes, 3,000,000; leukocytes, 800; of eighty cells counted, seventy-seven were lymphocytes, two, neutrophil leukocytes and one, a monocyte. Treatment consisted of the injection of a nonspecific substance containing albumin, lipoid and fat. He summarized the course of the disease as follows:

On the patient's second day in the hospital, the disease aspect was about as serious as on the day of admittance. The temperature was somewhat reduced, and the number of leukocytes somewhat increased. The ulcerative process, however, was increased, so that the patient refused nourishment on account of the difficulty in swallowing. On the following day, some improvement was noted. The tempera-

---

11. Ashworth, O. O., and Maphis, E. C.: Agranulocytic Angina, Virginia M. Monthly **54**:237, 1927.
12. Finnigan, F. R.: J. Missouri M. A. **24**:258 (June) 1927.
13. Hill, H. P.: California & West. Med. **25**:609, 1926.
14. Sachs, A.: Nebraska M. J. **13**:81 (March) 1928.
15. Koehler, G. D.: Deutsches Arch. f. klin. Med. **155**:155, 1927.
16. Lauter: Med. Klin. **20**:1324 (Sept. 21) 1924.

ture was still lower, and the count of the leukocytes was almost doubled. The glands had swelled and caused a moderate degree of lockjaw. In the following days, the patient steadily improved, and what is most remarkable about the case, with the continued improvement of the general condition, the condition of the blood continued to improve, until with the full return of health it was normal. On the fourth day after admission, the temperature was about normal, and the necrosis began to scale off. The count of the leukocytes reached 4,000. The picture showed beginnings of a reverse shifting. After ten days, all ulcerative processes in the mouth were healed; after three weeks, the glands on the left side of the neck were incised. The leukocytes at this time had reached the above normal count of 12,500. Examination of the blood showed a decided reverse aspect. After nine weeks, the patient was dismissed with a normal aspect of the blood.

Weiss [17] reported one fatal case and gave a full comprehensive study of about twenty-five cases already reported. His patient was a child, aged 6 years, whose parents were perfectly healthy. Two of their children had died of septic disease, while a fourth child was in good health at that time. About fourteen days before examination the child became ill with an inflammation of the middle ear. A paracentesis was performed on the tympanic membrane, whereupon the inflammation decreased. Soon there was a laryngeal-pharyngeal condition. The whole throat was inflamed, and the membrane of the soft palate, the uvula, the gums and the lips were covered with an originally slimy, and later porcelain-like, necrotic coating. The temperature rose to 39.6 C. (102.7 F.). After a few applications of neoarsphenamine, some of the coating was removed, and the temperature was reduced to 38.4 C. (100.7 F.). The next day, however, a renewed advance occurred in the temperature to 40.1 C. (104.1 F.), and the child was taken to the "Elisabethina."

The child lay with a painfully drawn face, feverish red; she could hardly speak, and opened her mouth only with great difficulty. The intake of nourishment was difficult; every swallow was painful for the patient. Inspection revealed a veillike white coating on the palatine arch, the hard palate and the uvula. The edge of the tongue was ulcerated on various spots, the gums and the mucous membrane of the lips were covered with necrotic, bloody-white coatings. The action of the heart was increased; the pulse rate was 140, and the cardiac sound was clear. There was rough, vesicular respiration over both lungs. The liver was not enlarged; the spleen extended a bit over the edge of the costal arch, and was palpable under deep respiration. At the edge of the lower jaw, a few small glands were felt. In addition to the foregoing observations, the vagina and rectum became extensively ulcerated, and the child had a profuse diarrhea. Death occurred on the tenth day.

The first examination of the blood yielded the following results: color, ruby red (Sahli) 60, in per cent 85; erythrocytes, 4,200,000; leukocytes, 3,300; color index, about 1. The red corpuscles showed a slight "anisozytose," a trace of "poikilozytose"; wholly sporadic cells showed polychromatic color-tone; there were no nucleated cells, no plasmodia and no pathologic leukocyte forms. The differential counts revealed polymorphonuclear leukocytes, 38 per cent; lymphocytes, large, 43 per cent; lymphocytes, small, 2 per cent; mononuclear leukocytes, 12 per cent; eosinophil leukocytes, 3 per cent; transitional forms, 2 per cent.

The second examination of the blood gave the following results: The count of the white corpuscles was 1,480. The proportion by percentage of the white corpuscles was as shown in the table.

---

17. Weiss, J.: Wien. Arch. f. inn. Med. **14**:303 (March) 1927.

Weiss reported six other cases of dyscrasia of the blood, not agranulocytosis, with a differential diagnosis and suggested the name, "mucositis necroticans agranulocytica"; he gave a bibliography of eighteen articles.

Peritz [18] and Türk [19] each reported one case of true angina agranulocytosis.

Briefly summarizing, Dr. Rösler [20] said one might assert that agranulocytosis, to all appearances, is a special disease in which, on the whole, it is a matter of an elective injuring of the leukoblastic part of the bone marrow, whereby the disappearance of the granulocytes is the direct result of this isolated injury of the bone marrow. The peculiar nonresistance of the tissues, as related to the rapid lethal course, finds a plausible explanation in the agranulocytosis.

For prognosis, it is of the greatest importance to determine whether the agranulocytosis of the peripheral blood has for its cause a leukoplasia of the bone marrow, for only in these cases with wholly nonreactive bone marrow, is an absolute, unfavorable prognosis justified. The two patients who recovered and

Percentage by Proportion of White Corpuscles in Weiss' Patient

Types of Cells	Percentage values	Absolute values in c. mm.
Lymphocytes	80.0	1,184
Large mononuclear leukocytes (Ehrlich), monocytes	18.0	266
Polymorphonuclear, neutrophil leukocytes	1.0	14
Eosinophil cells	0.0	0
Mast cells	0.0	0
Plasma cells	0.5	8
Youthful formations	0.5	8

the experimental reversible agranulocytosis show the possibility of incomplete, or only temporary injury of the bone marrow, wherein lies a hope of recovery or at least a more favorable prognosis is allowed.

Feer [21] gave a review of the observations in the blood in 29,498 consecutive cases. In 186, the leukocytes numbered 3,000 or less. He concluded from an analysis of these cases that septic illnesses may run their course with the severest leukopenia and complete or almost complete disappearance of granulocytes, or without hemorrhagic diathesis, thrombopenia and anemia. It is known that under septic conditions ulcerous necrotic processes may appear on the mucous membranes, and that icterus may occur. Further, neither endocardiac symptoms nor septic spleen tumors are present in every case of sepsis; and, as concerns the primary source of infection, it is not always revealed in a case of sepsis, else the expression created by Leube, "kryptogenetischen" septic pyemia, would not have been maintained. Finally, blood gained by puncture of the veins in sepsis may be sterile, and in the bone marrow the erythropoidal apparatus and also the megakaryocytes may be normal.

Real differential diagnostic symptoms between agranulocytosis and septic diseases, therefore, do not exist. The transitions are flowing.

18. Peritz, E.: Zentralbl. f. Chir. **54**:2129 (Aug. 20) 1927.
19. Türk, W.: Wien. klin. Wchnschr. **20**:157 (Feb.) 1907.
20. Rösler, O.: Wien. med. Wchnschr. **77**:603 (May 7) 1927.
21. Feer, W.: Contribution to the Question of Agranulocytosis, Schweiz. med. Wchnschr. **56**:551 (June) 1926.

Agranulocytosis, therefore, is not an independent disease, but represents a variety of septic illness. Why a septic illness can run its course in this manner, whether especially virulent germs or an inborn or acquired weakness of the bone marrow, especially of the granulocyte apparatus, exists, cannot be determined. He concluded that agranulocytosis is not an essential but a symptomatic disease, an atypical sepsis.

This symptom-complex should, therefore, be designated as "sepsis agranulocytotica."

Schaefer [22] gave a comprehensive survey of diseases involving the blood with cases illustrating them and two cases of agranulocytosis.

Gimplinger's [23] case does not seem to fall within Schultz' definition of agranulocytosis, but rather belongs with those of severe changes in the blood due to long continued severe sepsis.

I was unable to review the cases of Fumagalli,[24] Taddi [25] and Weihmüller.[26] Other articles [27] were reviewed and their cases included in the number reported.

REPORT OF CASES

Case 1.—Miss Anna N., aged 24, a nurse and a technician in a hospital, in the fall of 1925, began to have fever. Small cervical glands were found. The white cell count was 6,000 with the number of lymphocytes increased to 70 per cent. After six weeks, the tonsils were removed. The fever disappeared after that. The number of lymphocytes was gradually reduced to 60 per cent. She felt tired. Anemia persisted. On Dec. 26, 1926, she was taken ill with an acute respiratory infection and confined to her home. The infection apparently yielded to treatment, and she seemed much better on the second day. On the afternoon of the third day, she suddenly developed a severe sore throat, and her temperature rose to 105 F. She was taken to the hospital. Examination of the blood revealed a low white cell count as follows: white cells, 1,350; large lymphocytes, 20 per cent; small lymphocytes, 80 per cent. A record of red cells or hemoglobin content was not made. The entire throat was swollen and extremely painful. The following day a large ulcer appeared on the postpharyngeal wall, and the mucous membrane over the arytenoid cartilages and epiglottis became edematous. She was unable to swallow, and the secretion had to be removed with a suction pump to prevent her from suffocating. On the third day, she became worse and died during the afternoon. The laboratory reported that the throat culture showed

---

22. Schaefer, R.: Deutsches Arch. f. klin. Med. **151**:191 (May) 1926.

23. Gimplinger, E.: Angina Agranulocytosis, Med. Klin. **31**:1073 (Aug. 3) 1924.

24. Fumagalli, C. R.: Pensiero med. **16**:149 (March 20) 1927.

25. Taddei, F.: Riv. di clin. med. **28**:307 (April 30) 1927.

26. Weihmuller, J. W.: Rev. méd. del Rosario **17**:276 (June) 1927.

27. Borchers, K.: Ztschr. f. Laryng. Rhin. **15**:386, 1927. Carnot, R. J., Weissenbach and others: Bull. et mém. Soc. méd. d. hôp. de Paris **51**:1009 (July 7) 1927. Elkeles, A.: Agranulocytic Angina, Med. Klin. **20**:1614 (Nov. 16) 1924. Hart, V. K.: Laryngoscope **37**:798 (Nov.) 1927. Hopman, R.: Deutsches Arch. f. klin. Med. **142**:196 (April) 1923. Linthicum, F. H.: Ann. Otol. Rhin. & Laryng. **36**:1093 (Dec.) 1927; abstr., California & West. Med. **27**:78 (July) 1927. A practically complete bibliography of the literature up to 1927 will be found in Kastlin's article (footnote 3, page 813). Literature since then is referred to in the text.

hemolytic streptococci. A dried smear revealed many organisms, including some Vincent's organisms.

Local treatment to the throat apparently was useless, and only irritated the patient. On the second morning, 20 cc. of antistreptococcic serum was given, without any effect.

Her blood count from former records was: in January, 1926, white cells, 8,000, and large lymphocytes, 60 per cent; in August, 1926, white cells, 12,000, and large lymphocytes, 70 per cent. A differential count was not made at that time.

CASE 2.—Miss B., aged 40, a clerk, had complained of backache for two years. It became worse with activity. She was always tired and for the last two weeks before examination had been particularly tired out. Her appetite was poor. She was working but was about compelled to give up. Her color was poor and sallow. The tongue was smooth, and there was not any evidence of sore throat. There was a systolic murmur over the pulmonic area, but no change in the size of the heart. The liver was not enlarged, and there was no enlargement of the spleen. The stomach showed complete achlorhydria. On the night of Oct. 6, 1927, she became rapidly much worse, and she entered the hospital the following morning. When admitted, she had a temperature of 102.4 F., and was greatly prostrated and evidently gravely ill. Her physical examination yielded negative results except for the throat and the blood. The throat was swollen, and the mucous membrane pale pink and edematous. The edema did not involve the larynx. No ulcer developed, and, while the throat was very sore, she was always able to swallow and keep the mouth and throat free from secretion.

Examination of the blood revealed: hemoglobin content, 46 per cent; red cells, 3,300,000; white cells, 2,800; neutrophils, none; large lymphocytes, 13 per cent; small lymphocytes, 36 per cent. The red cell count remained about the same, but the white cell count gradually dropped to 800. Another examination of the blood made on Oct. 4, 1927, three days before she entered the hospital, revealed: hemoglobin content, 45 per cent; red cells, 3,370,000; white cells, 2,800; basophils, 0; eosinophils, 0; total granulocytes, 7, including myelocytes, 1; juvenile neutrophils, 0; staff form neutrophils, 1, and segmented neutrophils, 5; large lymphocytes, 9 per cent; small lymphocytes, 80 per cent; monocytes, 4 per cent; no granulocytes.

Culture from the throat at the hospital revealed *Staphylococcus aureus*, but no streptococcus or diphtheria bacillus.

Medication consisted of local treatment to the throat—hot cleansing gargles, and 10 per cent mild silver protein applied on cotton applicators four times daily. Benefit did not result from this treatment.

She was given antistreptococcus serum, 50 cc. daily, and transfusion of whole blood, 500 cc., on the second and fourth days. Nothing that was done affected the course of the disease, and she died on the fifth day in the hospital.

CASE 3.—Mrs. T. P. L., aged 56, the wife of a physician, had a cold with an acute sore throat two weeks before admission to the hospital. At that time, the right tonsil was swollen and painful. This swelling cleared up with the cold. Three days before admission, the left tonsil became swollen and painful, and had the appearance of a peritonsillar abscess. She walked into the hospital after a trip of twenty miles, and although she was a little tired, she seemed to be in good spirits, and was able to joke a little. With the exception of her sore throat, she appeared to be in excellent physical condition. The temperature was 101 F. The pulse rate was 90, and respirations, 20. Urinalysis gave normal results. Not suspecting any condition other than that of the throat, I incised the

supposed peritonsillar abscess at once. On incision, a drop or two of thin grayish fluid escaped, and the wound gaped open showing a grayish necrotic looking cavity. The other tonsil was small and not inflamed. The nose and nasopharynx were clean, and the mucous membrane was normal. The postpharyngeal wall and larynx were normal.

A culture made from the wound later was reported to reveal *Streptococcus viridans.*

A general physical examination did not reveal any other pathologic conditions. The patient had been having mild attacks of asthma during the past year for which she had been in the Immanuel Hospital in Omaha during December. Since the beginning of the throat attack, two weeks before admission to the hospital, the asthma had not given her any trouble. The observations in the blood were as follows: red cells, 4,500,000; white cells, 800; large lymphocytes, 32 per cent; small lymphocytes, 60 per cent, and young cells, 8 per cent. Granulocytes were not found. A tentative estimate of the hemoglobin content was 75 per cent.

On the basis of this report, a diagnosis of angina agranulocytosis was made, and Drs. George Pratt and LeRoy Crummer asked to assist in the care of the patient.

On account of her high red cell count, and the failure of the transfusion of whole blood to benefit the patient in case 2, it was decided to use scarlet fever streptococcus antitoxin, on the assumption that the source of infection was probably a streptococcus. In addition, she was given sterile milk and whole blood intramuscularly. The administration of oil of turpentine was considered, but the reactions from the foregoing treatment were so marked that it was not used. Locally, she used frequent hot gargles, and 4 per cent silver or 1 per cent mercurochrome were applied to the wound in the throat twice daily. Her throat was very sore, and it was difficult for her to swallow on account of pain for the first two days; then the condition in the throat became less severe, and she could swallow without much discomfort. The appearance of the throat remained practically unchanged during the disease. The area around the tonsil was red and a little swollen. The wound gaped and showed a grayish base. For the first four days, her general appearance was so good that it did not seem possible that she was so gravely ill. She was mentally bright, and her skin was moist and firm, but still her illness was much too severe to be due to so slight a lesion in the throat. The medication apparently did not have any effect on the course of the disease. The white cell count continued to drop, and the patient died on the seventh day after entering the hospital.

Examination of the blood made while she was in the Immanuel Hospital, on Oct. 30, 1927, revealed: hemoglobin content, 90 per cent; red cells, 5,590,000; white cells, 5,600; neutrophils, 69 per cent; large lymphocytes, 26 per cent. This was less than two months previous to her entry into the Clarkson Hospital and only about six weeks previous to the acute cold and sore throat which seemed to be the beginning of the agranulocytosis.

Hot gargles and local applications to the throat may have given a little comfort to the patient.

SUMMARY

I have discovered nothing new in the three cases reported. All the patients were women, and in each case the general health of the patient had been lowered for some months before the onset of the angina.

The degree of prostration was out of proportion to the apparent lesion. This was expressly so in case 3.

The four cases reported from Omaha in one twelve months' period indicate that the condition may be more common than was before suspected.

The differential diagnosis depends on the blood picture.

In two of my cases examinations of the blood made previous to the onset of the acute condition showed a lowered white cell count and a disproportion of lymphocytes. Several other cases reviewed showed the same condition.

A different organism was found in each throat, and there were none in the blood stream. Hence, deductions as to a specific infection cannot be made.

A report on the condition of the bone marrow taken from case 3 coincides with the theory that the disease probably is due to some toxin that destroys the granulocytic blood cells and inhibits the blood forming centers of the bone marrow from further production.

The treatment given did not have any effect on the course of the disease.

Autopsies could not be performed.

ENDOSCOPIC TREATMENT OF PULSION DIVERTICULUM

A FURTHER REPORT *

CHARLES J. IMPERATORI, M.D.
NEW YORK

A method of inverting pulsion diverticulum through the endoscope and ligating it, was presented before this society last year. Three cases in which operation was performed by this method were reported at that time.

Since then, four other cases with pulsion diverticulum have been studied. One patient who was operated on by the method of inversion of the sac and ligation, unfortunately died from lobar pneumonia five days later. A mediastinitis did not seem to be present, but as autopsy was not performed, this fact cannot be proved. It was felt, moreover, that if a patient with a pulsion diverticulum is past middle life, the safest methods of operation should be employed. If this apparently simple procedure can cure a patient of his symptoms, it should be used, but only after a proper explanation of its possibilities and limitations.

Because of the danger of esophageal trauma and the possibility of extension of inflammatory products and infection into the mediastinum, the patients were advised concerning the method of procedure. Unfortunately, none of the patients was willing to accept the plan outlined.

At the initial esophageal examination, performed under local or general anesthesia, failure to invert the sac calls for an immediate external operation, as sufficient trauma may be done to the sac to induce a fatal mediastinitis. At all events, after failure to invert the sac, whether or not a complete operation follows immediately, the superior mediastinum should be walled off by a deep incision in the neck; the lower part of the superior mediastinum should be packed with iodoform gauze in order to prevent a descending infection.

Jackson's dictum that the esophagus is one of the organs that is most intolerant of trauma has been proved frequently and should always be borne in mind in operations on the esophagus. If this is done, there will be fewer fatalities.

---

* Submitted for publication, Dec. 13, 1928.

* Read at the Eleventh Annual Meeting of the American Bronchoscopic Society, Washington, D. C., April 30, 1928.

CONGENITAL ATRESIA OF THE ESOPHAGUS WITH TRACHEO-ESOPHAGEAL FISTULA *

W. LIKELY SIMPSON, M.D.
MEMPHIS, TENN.

Malformations of the esophagus are encountered so rarely in the practice of most physicians that reporting each case should be encouraged. A physician with a large practice, both private and institutional, may pass a lifetime without seeing a case of this sort. Many cases, in fact, are overlooked because of their similarity to other conditions.

Cautley [1] has given the following satisfactory classification of the malformations:

(1) Complete absence, usually associated with gross malformation as in monsters.

(2) Double esophagus, with reunion at the lower end (rare)

(3) Diverticula or pouches, pharyngeal rather than esophageal, situated posteriorly at the junction of the pharynx and esophagus.

(4) Cysts.

(5) Tracheo-esophageal fistula, without any other abnormality (rare).

(6) Congenital dilatation, usually just above the diaphragm (quite rare).

(7) Atresia without fistulous communication with the trachea a malformation of various types and rather common.

(8) Atresia with the lower end of the esophagus opening into the trachea and rarely into a bronchus. The majority of the cases are of this type and are remarkably alike in anatomic appearance, as shown in the three cases herein reported.

Atresia of the last-named type almost always is level with, and just posterior to, the bifurcation of the trachea. There may be a cord-like connection between the upper and lower segments; the opening may be only a small slit or quite a large, round opening. There may be other malformations of the body, such as an imperforate anus, but usually there is not.

The symptoms of the condition are necessarily strikingly similar in all cases. The infant takes food but almost immediately regurgitates it. Mucus and saliva, sometimes of a frothy nature, run from the mouth and nose. Crying often forces air into the stomach through the fistula. Vomiting forces mucus into the lung, also food, if gastrostomy has been done. Coughing, choking and cyanotic attacks are brought on by feeding. Toward the last, symptoms of bronchopneumonia and starvation appear.

---

* Submitted for publication, Dec. 13, 1928.

* Read at the Eleventh Annual Meeting of the American Bronchoscopic Society, Washington, D. C., April 30, 1928.

1. Cautley, Edmund: Children's Diseases, Brit. J. Child. Dis. **14**:1, 1917.

Diagnosis should not be difficult if the symptoms are noted carefully. Air in the stomach and upper part of the abdomen and flatness of the lower part of the abdomen are good diagnostic signs. The use of x-rays will assist greatly. The passage of a catheter or a small esophageal tube will help to verify the diagnosis. The use of barium sulphate has been a step forward in diagnosis.

The patients live only a few days, most of them only from two to five days; often death occurs from pneumonia. Cautley says that life

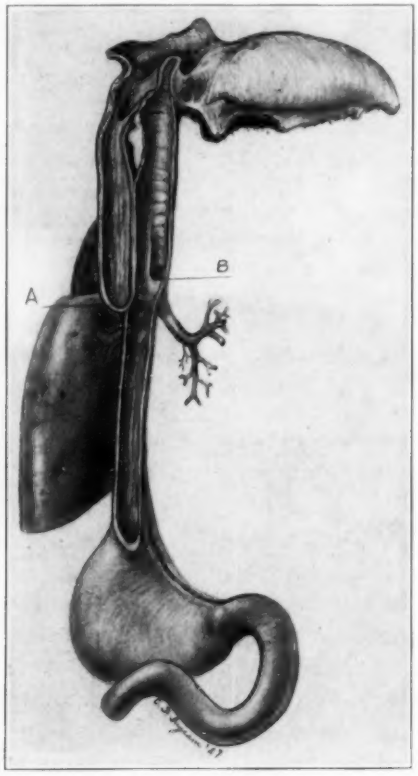


Fig. 1.—Atresia in case 1, viewed from the right side, slightly to the rear. *A* indicates the atresia of the esophagus; *B*, the tracheo-esophageal fistula.

has been prolonged for fourteen days by gastrostomy. One of my patients, who lived for sixteen days, died from bronchopneumonia following a gastrostomy.

No treatment has done more than prolong life a few days. Gastrostomy, which is so often performed, is never, of course, of permanent benefit. Richter [2] designed an operation to close the tracheo-esophageal

2. Richter, H. M.: Congenital Atresia of the Esophagus, Surg. Gynec. Obst., October, 1913, p. 397.

fistula by tying off the upper end of the lower segment of the atresic portion just before it entered the trachea; the operative approach was through the back. A procedure of this sort gives the only hope of permanent benefit. Although formidable and possibly impracticable, I believe that it should be attempted.

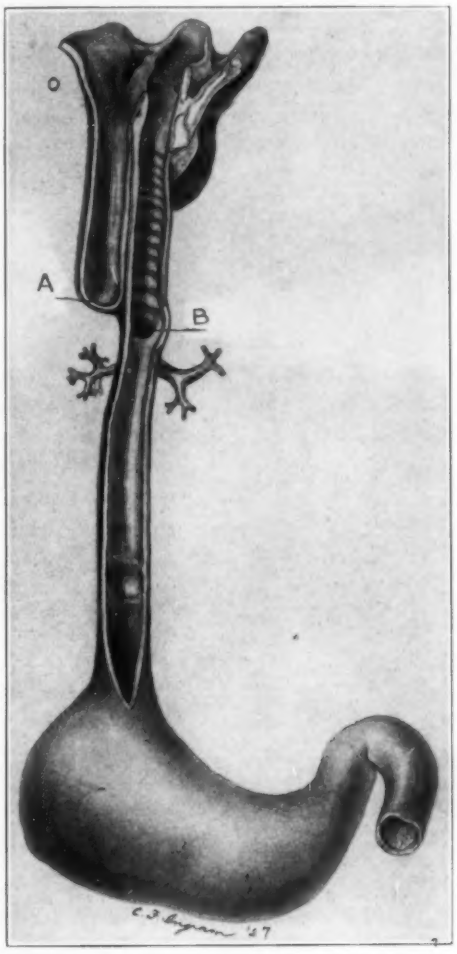


Fig. 2.—Atresia in case 2, viewed from the right and rear. *A* indicates the atresia of the esophagus; *B*, the tracheo-esophageal fistula.

REPORT OF CASES

CASE 1.—W., a boy, born April 29, 1927, was delivered in the service of Dr. Percy Toombs. The patient developed the symptoms of atresia described in the foregoing paragraphs. Dr. Bethea made roentgenograms, using barium sulphate, etc., and a gastrostomy was performed by Dr. J. L. McGehee. The patient died on the sixth day of life.

Postmortem examination showed complete atresia of the esophagus, ending just above the bifurcation of the trachea. The lower end of the atresia portion was just above the bifurcation. The lungs showed bronchopneumonia, but nothing else of significance.

CASE 2.—M., a boy, was born on May 9, 1927, in the service of Dr. J. J. Hobson. The usual symptoms of atresia of the esophagus and tracheo-esophageal fistula were noted—regurgitation of food, choking, cyanosis, etc. Gastrostomy was performed by Dr. J. L. McGehee. The patient died on the fifth day after birth. Postmortem examination showed exactly the same observations as those in case 1.

CASE 3.—J., a boy, in the pediatric service of Dr. Tom Mitchell, showed the usual symptoms of atresia of the esophagus and tracheo-esophageal fistula. A

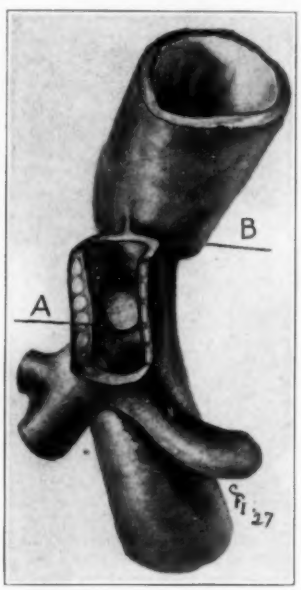


Fig. 3.—Atresia in case 3, viewed from the front and above. *A* indicates the tracheo-esophageal fistula; B, the atresia of the esophagus; X 2½.

gastrostomy was performed by Dr. Max Henning. The patient was fed rather freely for eleven days. He died of bronchopneumonia on the sixteenth day of life.

Postmortem examination showed the same condition as that found in cases 1 and 2.

I was led to report the foregoing cases by the fact that all three were seen within a period of about ten days, and that the third patient lived for sixteen days, a longer period than any reported in the literature.

Although a great deal has been written about the cause of the malformation, few definite statements have been made.

AN ANTRO-ETHMOSPHENOIDAL OPERATION *

FREDERICK MYLES TURNBULL, M.D.
LOS ANGELES

The transantral route of operation on the sphenoid sinuses was first described by Jansen at the Moscow Congress of 1897. Following his description at intervals, with various modifications, were those of Boeminghaus, Luck, Berens and Furet and in this country, those of Mosher and Sewell. The different writers have described operative methods on the sphenoid and ethmoid sinuses in which this route was used with varying degrees of success. Jansen's operation was performed under general anesthesia with a great deal of bleeding, which made the operation extremely difficult. His procedure was radical, destroying the middle and inferior turbinates; this was naturally followed by atrophic changes in the upper respiratory tract, with frequent secondary infections in the lower respiratory tract. This form of operation consequently was soon abandoned. The various other methods suggested have also given such a limited degree of satisfaction that a recognized method has not been adopted by rhinologists, though great advance has been made by Sewell in his recent publications. My associates and I have been working on this problem for about eleven years with, we feel, a considerable degree of success.

The majority of physicians of experience will admit that the necessity for such an operation exists, because most intranasal work in the past has led to extensive destruction of the upper portion of the nose with concomitant failure to remove a great portion of the area affected by the pathologic process, owing to the inaccessibility of the various ramifications of the ethmoidal labyrinth. This failure to reach the outlying ethmoidal cells has resulted in a large percentage of recurrences of polypoid tissue, which has led to repeated operations and has brought a questionable degree of satisfaction to both patient and surgeon. The operation described herewith, though radical in the sense of efficiently reaching the diseased areas, preserves the physiologic function of the nose as much as is possible, removes the pathologic area, provides drainage and does not leave any external, and little internal, evidence of the operative procedure. In fact, in many cases examination of the interior of the nose fails to reveal the evidence of this operative work.

INDICATIONS

1. Primarily, this operation is especially suitable in cases of chronic, advanced pansinusitis which have resisted all efforts at palliative treatment.

* Submitted for publication, Jan. 3, 1929.

2. The operation can be used successfully when extensive disease conditions of the ethmoids or sphenoids exist which cannot be reached from within the nose without great destruction of parts.

3. When ocular complications dependent on pathologic conditions of the ethmoid and sphenoid sinuses occur, the operation is suitable.

4. It is successful when roentgen examination shows infection of the suborbital ethmoidal cells.

5. The operation can be employed in removal of a foreign body, such as a bullet, from the ethmoid or sphenoid sinuses.

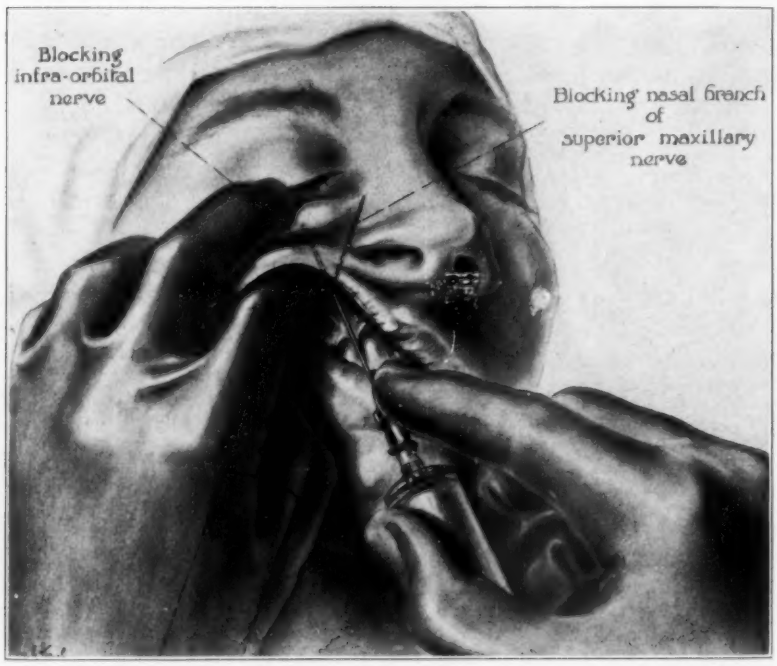


Fig. 1.—First step in blocking nerves.

PROCEDURE

Anesthesia.—The operative work is done entirely under local anesthesia; in eleven years, during which several hundred operations have been performed, general anesthesia has been used in only eight cases. Administration of the anesthesia is started in the patient's room, where, half an hour before the operation, thin tampons of cotton, saturated with equal parts of 20 per cent cocaine hydrochloride and epinephrine are placed in the superior, middle and inferior meati, packed firmly against the outer wall of the nose. The patient does not receive hypodermic injections prior to operation. When the patient reaches the surgery, the nerves are blocked with 2 per cent procaine and ephedrine solution (figs 1, 2 and 3.)

Using a fine platinum needle (gage 25 and 2 inches long) so as to follow the bony contour the operation proceeds as follows:—

The first injection is made into the infra-orbital foramen, blocking the infra-orbital nerve (fig. 1). Then, without complete withdrawal of the needle, the point is turned to the junction of the nasal bone with the nasal cartilage blocking the nasal branch of the superior maxillary nerve, approximately 0.5 cc. of the solution being used.

Next, the needle is introduced under the periosteum covering the posterior surface of the tuberosity located just above and behind the upper third molar (fig. 2). This will block the posterior branches of the superior dental nerve. About 0.25 cc. of procaine hydrochloride is required.

Fig. 2.—Blocking the posterior superior dental nerve.

Finally, the posterior palatine foramen is located by its slightly dimpled appearance in the hard palate just internal to the location of the third molar (fig. 3). After the needle is introduced into the foramen, it is withdrawn slightly before the injection is made as a precaution in case a vessel has been entered. Only a few drops of solution are used to block the large or anterior palatine nerve in its exit through this foramen. This finished, the anesthesia will be sufficiently advanced for the surgeon to make the incision without any period of waiting.

Opening of Antrum.—The first surgical step, that of opening the antrum, should be carried out through a high incision at the apex of the facioalveolar fold (fig. 4).

No attempt should be made to elevate the lower lip of this incision. This maneuver allows the edges of the wound to fall subsequently into exact coaptation, does away with the necessity of sutures and produces an indistinct scar with little retraction of parts. When the incision has been made, the periosteum is elevated only, and the parts are retracted with narrow retractors having a firm hand-grip. The antrum is then opened with a chisel to allow the introduction of a rongeur with which the anterior antral wall is resected to a sufficient degree to give good

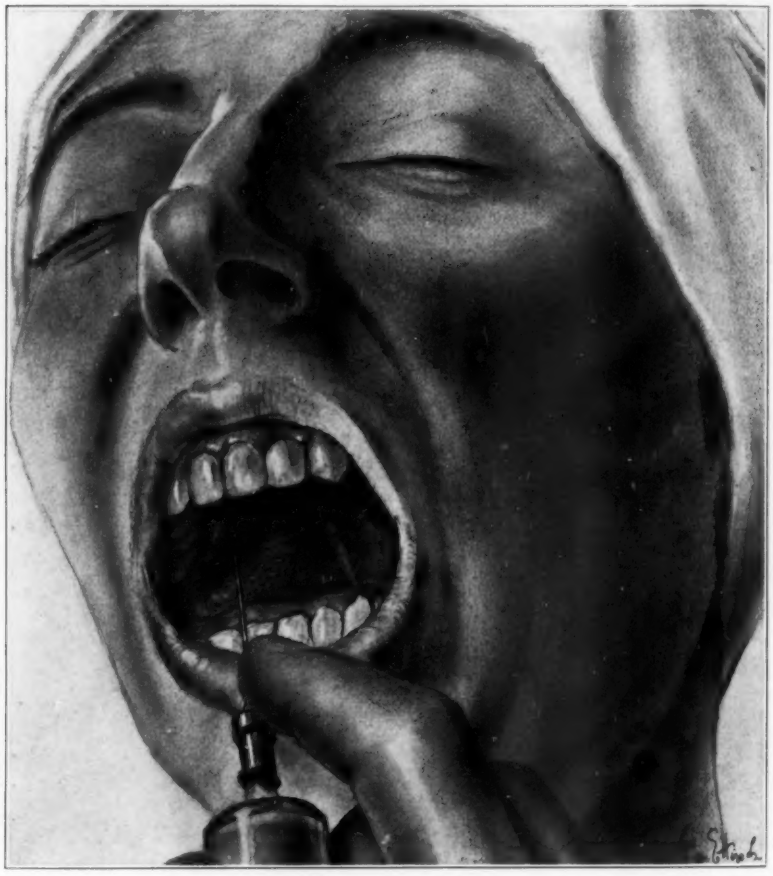


Fig. 3.—Blocking anterior palatine nerve.

visibility of the operative field. In this connection, the anterior wall must be removed well upward between the infra-orbital notch and the nasal bone to give a good approach to the ethmoidal labyrinth, as shown in figure 5. This point is so important that the operation may result in failure if adequate provision for operative approach and room to work is not made by carrying the removal of the anterior wall upward and inward as just mentioned.

When the anterior antral wall has been removed, time is saved if at this stage one proceeds at once to the naso-antral wall instead of cleaning out the

interior of the antrum. Here the object desired is the removal of a triangular section of bone in one piece from the naso-antral wall, leaving the lower turbinate in position, attached by its anterior and posterior ends. The operator then commences with a straight double-beveled chisel which is driven through the naso-antral wall of the inferior meatus as far forward as possible. There need be no fear of penetrating so far forward as to endanger the anterior attachment of the inferior turbinate. With the same chisel driven by a mallet, a horizontal incision is then carried backward, as close to the floor as possible, to the point where a ridge, usually quite definite, extends from the naso-antral wall across the floor of the antrum toward the external wall. The incision must not be carried backward beyond this point for fear of encountering the vessels from the pterygoid fossa, which are the source of bleeding in most operations in this vicinity. Having accomplished this, the operator reintroduces the same chisel

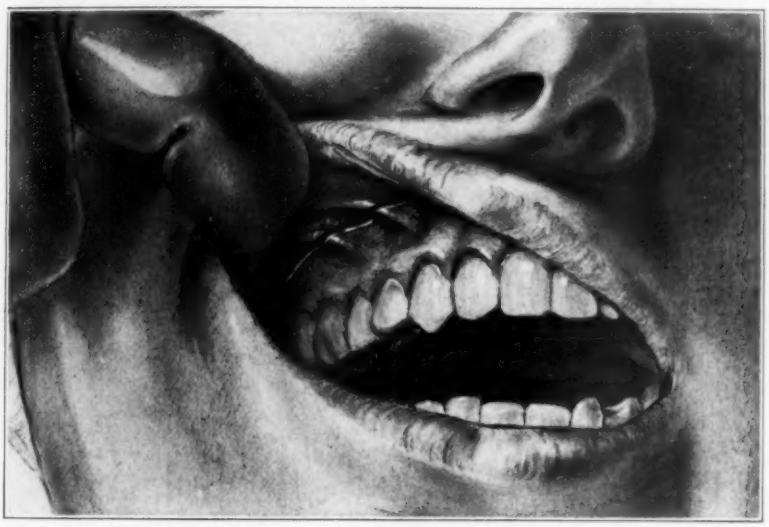


Fig. 4.—Incision at apex of facio-alveolar fold high above dental nerves.

in the original opening and carries a similar cut in the naso-antral wall upward and backward, parallel to the bridge of the nose (fig. 6). At its upper end, this incision should be on the level with, but in front of, the natural osteum maxillaris. In making this last incision, the operator need have no fear of detaching the inferior turbinate, because the chisel will cross the attachment of the inferior turbinate subperiosteally, leaving the mucous membrane here intact.

This done, the operator will have outlined a triangular piece of bone covered on the antral side with mucoperiosteum. Introducing the same chisel under the anterior-inferior angle, between the periosteum on the nasal side and the bony plate, he will find that the triangular piece outlined will fracture easily across its base. A right-angled rongeur can now be used to sever the membranous attachment of the triangular plate and also the mucoperiosteum of the naso-antral wall both above and below the inferior turbinate. At this time the pledgets which were originally placed in the inferior and middle meati will be found, and these can be discarded. The next step consists in removing the contents

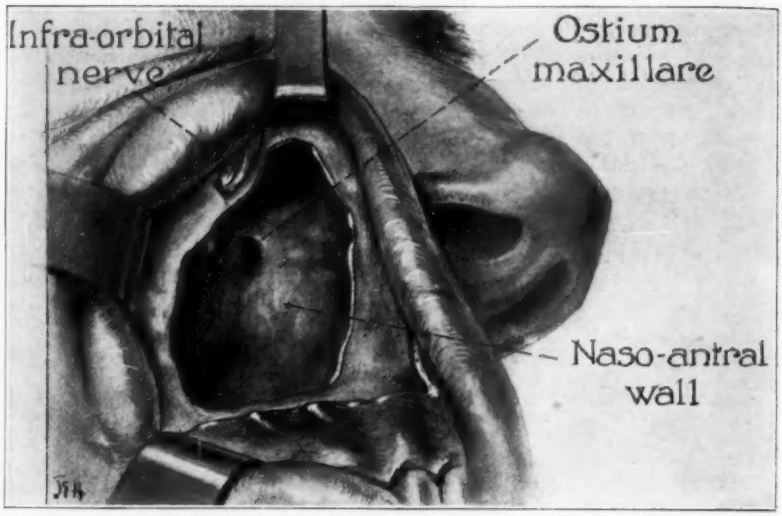


Fig. 5.—Dome-shaped excision of anterior antral wall.

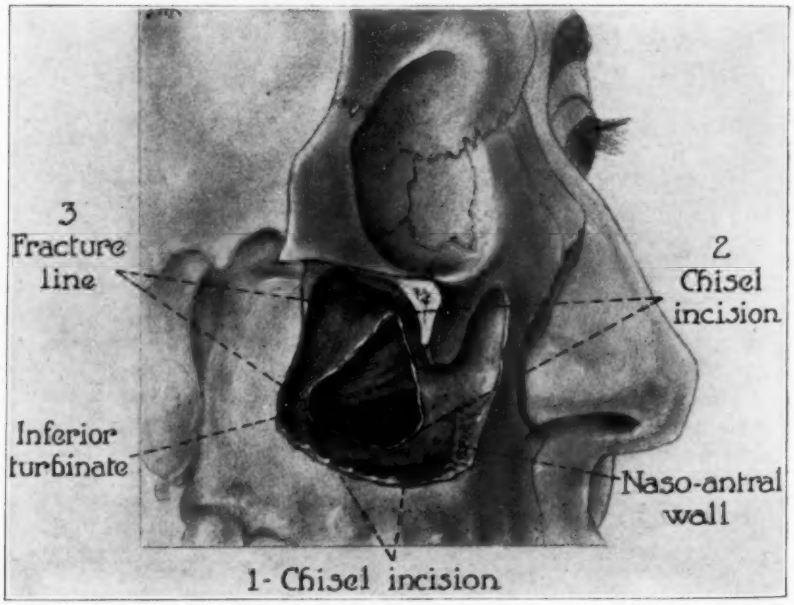


Fig. 6.—Initial excision of naso-antral wall.

of the diseased antrum. The operator may now be faced with two alternatives: First, if the degenerated areas are limited in extent these only need be removed, the remaining portion of the lining being permitted to remain. In this connection the most frequent sites of polypoid tissue have been found to be (*a*) the floor of the antrum, (*b*) the superior-external angle and (*c*) the anterior nasal-antral angle. On the contrary, if the lining membrane should be degenerated throughout, it is best to remove it entirely. This is probably most easily accomplished by a piece of gauze on the end of a stork forceps with which the membrane is stripped from the bone. Following this, the finger should be introduced into the antrum and this cavity palpated carefully to determine the presence of any remaining polypoid tissue or osteitis (Skillern). Hardly any bleeding will be observed.

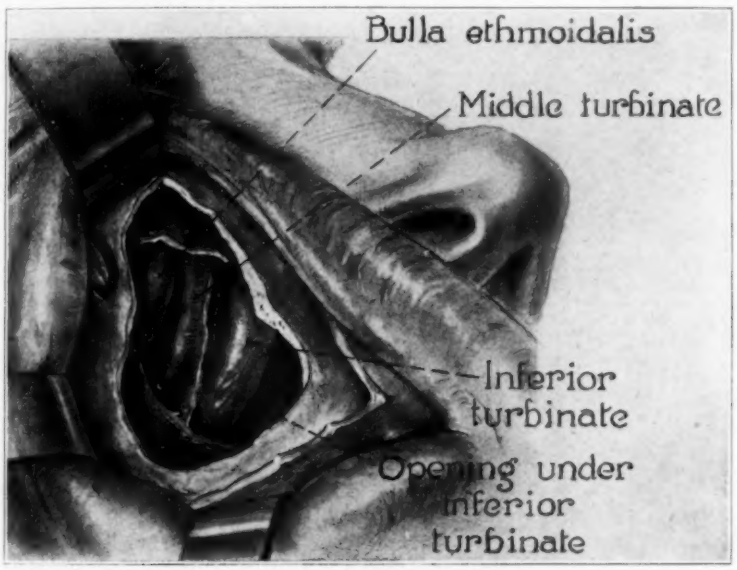


Fig. 7.—Completed excision of naso-antral wall with exposure of bulla ethmoidalis.

At this stage one must remove the remaining portion of the naso-antral wall upward until it is flush with the floor of the orbit at the nasal orbital angle, thereby exposing the anterior ethmoidal cells (fig. 7). In some cases in which the naso-antral wall bulges far outward into the antrum, obstructing the approach to the ethmoids, this wall must be resected upward and forward over the bulging portion in order to expose the ethmoidal cells properly. It may be that some branches of the sphenopalatine ganglion in this location need further anesthetizing; if so, pledgets may now be placed over the exposed bulla for a few minutes, during which time the operator can continue with his work on the lower portion of the naso-antral wall. The lower part of this wall is removed flush with the floor of the nose, first by a right angle rongeur, followed by a curet and finally by a rasp in order that this surface may be perfectly level with the floor of the nose.

Anterior Ethmoidal Region.—To open the ethmoidal capsule one first locates the bulla which is easily discovered on account of its prominence just external to

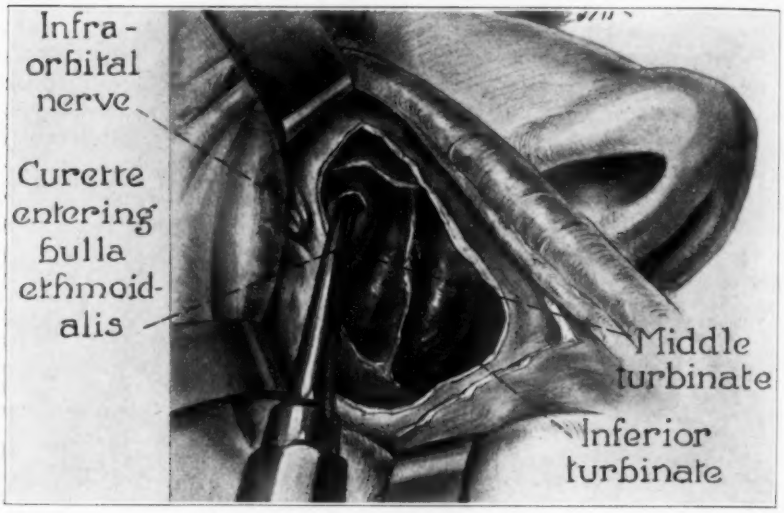


Fig. 8.—Opening of ethmoid sinus.

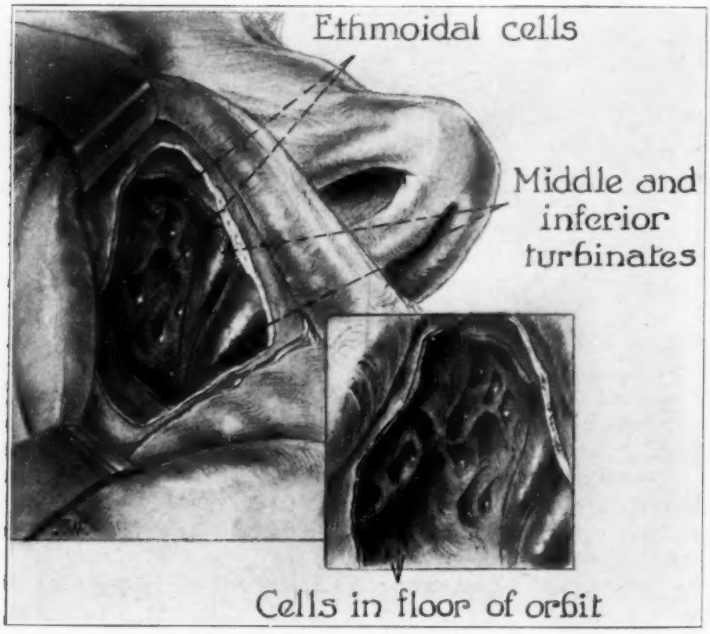


Fig. 9.—Dissection of ethmoid cells.

the middle turbinate. This may be opened with a Mosher curet, as shown in figure 8, or with biting forceps. The direction of force is parallel to the orbit, and at no time is pressure exerted on the orbital plate. The walls of each cell must be carefully removed, care being taken not to leave crushed bone or particles of bone attached by membrane, as these form obstructions which may impair drainage. All ethmoid cells in front of and behind the nasofrontal duct must be thoroughly removed so that the drainage from the frontal sinus will be unobstructed. The future of the drainage of the frontal sinuses will depend on complete removal of these cells.

In dissection of the anterior ethmoid cells at the angle of the orbit, one will usually find some ethmoid cells extending outward under the floor of the orbit (fig. 9). These suborbital cells usually extend from one fourth to one third of the distance of the orbital floor. This is found so constantly that it is regarded as a normal position of these cells. Occasionally, these suborbital cells extend half way across the floor of the orbit, and I have seen them extend the full width in three cases. These cells are easily reached from this approach and can be dissected without injury to the eye. These suborbital ethmoid cells, if present, usually empty into the antrum and are a frequent cause of continued infection of the antrum and changes in the eye after an intranasal ethmoid operation has been done. The position of these suborbital cells can be seen in the roentgenograms, even in the flat plate. Development of the frontal sinus is held by Scammon of the University of Minnesota to be simply overambitious or blownup ethmoidal cells, and the presence of cells under the orbit might be explained in a similar manner.

Posterior Ethmoids.—The dissection is then carried backward through the posterior ethmoids, the ethmoidal septums and the nasal wall of the ethmoid labyrinth being removed and this dissection being carried from the middle to the superior fossas external to the middle turbinate but without disturbing the anterior and posterior attachments of the latter (fig. 10). This will accomplish the desired effect of removing all extra cellular and intracellular polypi; it will open and drain all closed empyemas of the cells of this region and, if the intercellular walls are all removed, will provide permanent drainage in this locality.

Sphenoid Sinuses.—The foregoing procedure will have exposed the anterior wall of the sphenoid sinus which lies directly back in the depth of the wound and which may be recognized by its slightly bulging convex surface (fig. 10), the somewhat hollow sensation it gives on tapping and usually by the presence of its osteum. This anterior wall can be opened by a curet, not necessarily through the osteum, to permit entrance of a right angled biting forceps with which the anterior wall is removed downward and laterally until all the anterior wall has been removed. Particular stress is laid on removing this anterior wall until it is flush with the floor (fig. 11). The contents of the diseased sphenoid sinus may now be removed, whether they are polypi, septums, pus or simply diffuse degeneration of the lining membrane. Bleeding has not been a source of worry here, but if it occurs it can be controlled by crushing the bleeding point against the bony wall with blunt forceps.

Closure of Wound.—The operation is finished by simply allowing the edges of the wound to fall together. Packing is not usually introduced, as it has rarely been found necessary. Stitches are not used, the natural folds of the tissues of the cheek holding the edges of the incision in place. Inspection of the interior can be made during the next twenty-four hours if deemed necessary.

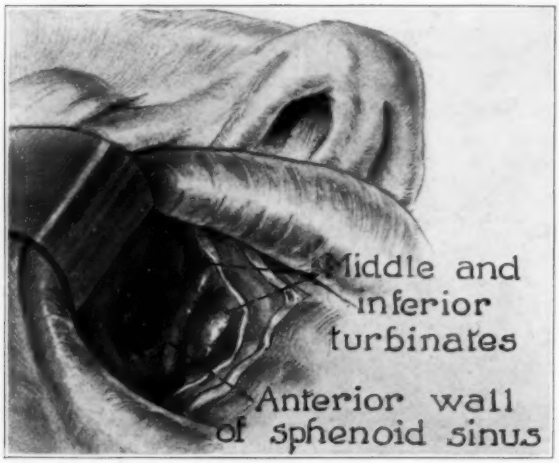


Fig. 10.—Completed dissection of ethmoids.

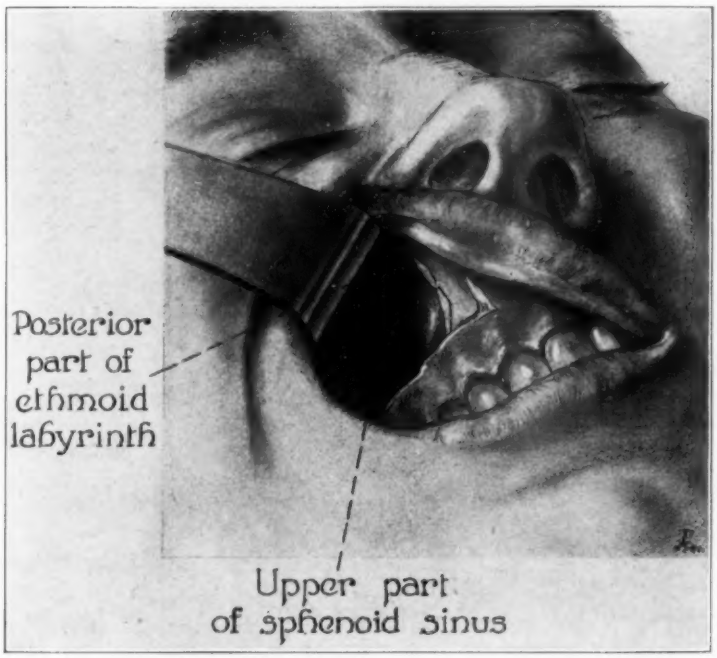


Fig. 11.—Completed dissection of sphenoid.

Postoperative Care.—On his return to bed, the patient is given a hypodermic injection of morphine in some form, and an ice bag is applied continuously to the face for forty-eight hours. The patient usually leaves the hospital on the fourth day.

COMMENT

1. The operation described makes it possible, with one operative step, to drain the antrum and the frontal sinuses thoroughly and to dissect the ethmoid and sphenoid sinuses without destroying any of the turbinates.

2. With it, one can handle all typical and atypical anatomic formations of the interior of the antrum and ethmoid sinuses.

3. This approach gives a larger field for work on the ethmoid and sphenoid sinuses and is from 1 to 2 cm. closer than the intranasal approach (Jansen).

4. The complete operation can be done in less than an hour with hardly any postoperative shock.

5. Placing the incision as high as possible and not removing the lower edge protect the nerve supply to the upper teeth. I have yet to see the first case in which the teeth have been devitalized by this procedure.

6. The physiologic function of the nose will be preserved to the greatest degree by this method of draining the various sinuses.

523 W. 6th St.

REPLACEMENT OF THE LOWER END OF THE DISLOCATED SEPTAL CARTILAGE VERSUS SUBMUCOUS RESECTION OF THE DISLOCATED END OF THE SEPTAL CARTILAGE*

MYRON METZENBAUM, M.D.
CLEVELAND

Dislocation of the lower end of the septal cartilage may be part of the nasal deformity resulting from severe injuries to the nasal bridge. The bony framework is fractured, depressed and distorted, and the bony and cartilaginous septum fractured and dislocated. For the proper correction of such a septum, the entire nose must be reconstructed.

First, the spread nasal base must be brought together. This raises the depressed nasal bridge. The raising of the depressed nasal bridge reestablishes the original space occupied by the septum, so that the bony portion of the septum can be reset; then the cartilaginous portion of the septum and, finally, the lower fractured dislocated end of the septum may be reset in the median line.

The second general class of nasal injuries in which the lower end of the cartilaginous septum is fractured and dislocated occurs in children when they fall on the face, striking the tip of the nose, fracturing the cartilaginous septum and dislocating the lower end from the groove in the vomer from its supporting position in the columella and from its supporting position to the soft tissues of the nasal tip; this results in a drooping of the nasal tip and a partial occlusion of one or both nares.

This type of injury is not usually recognized, because it is hidden in the immediate swelling of the soft tissues. When the injury is recognized later, the advice is "the child will outgrow it" or "not to do anything until the age of 16 or 18 years when the nose attains its full development so as not to injure a growing center, as this may hinder the development of this part of the nose."

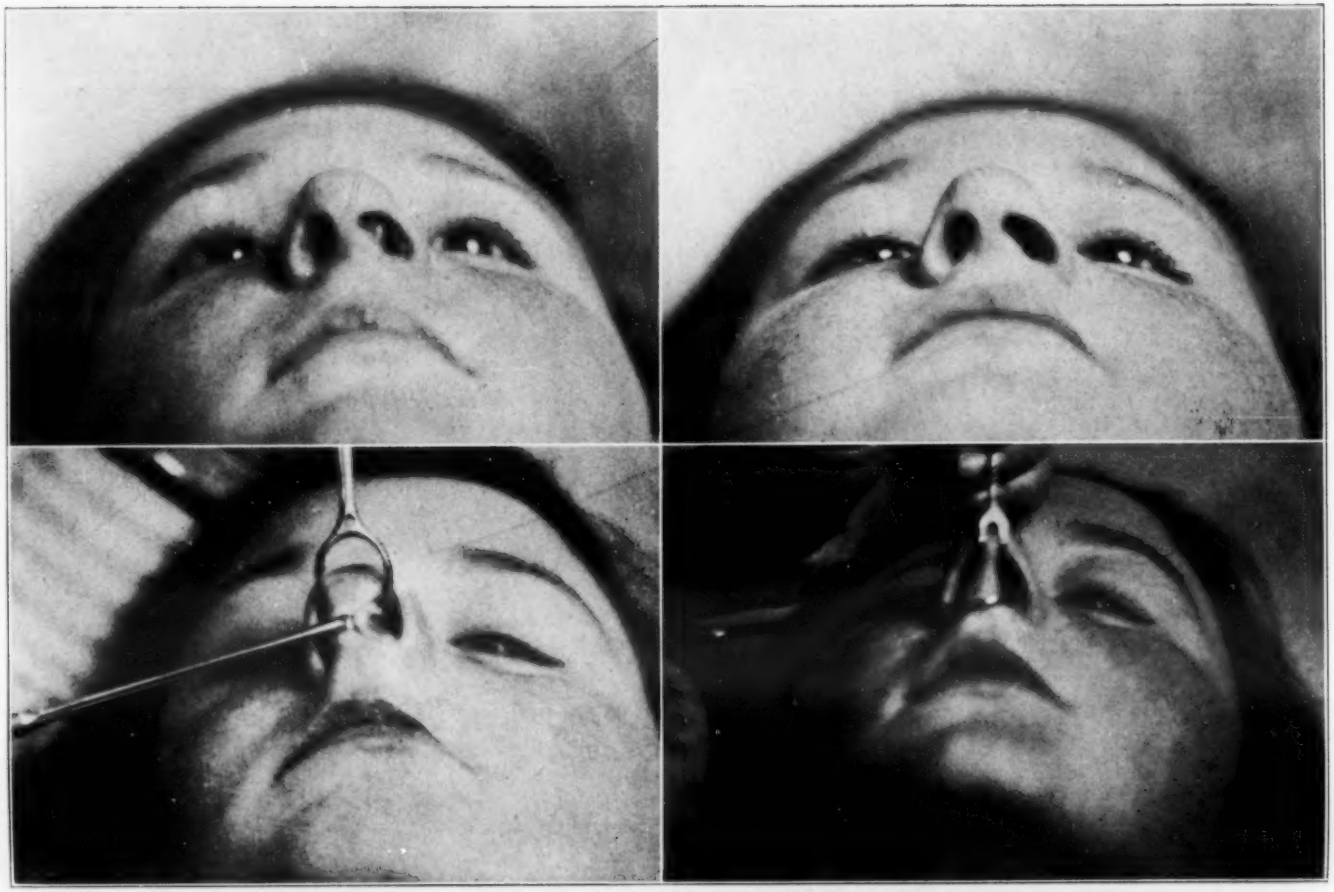
A fractured or dislocated bone or cartilage in any other part of the body is always replaced immediately, so that part of the body will have the normal support from the bone and cartilage, and so that the bone and cartilage will continue their normal growth. Under no ordinary cir-

* Submitted for publication, Aug. 23, 1928.

* Read before the Section on Laryngology, Otology and Rhinology at the Seventy-Ninth Annual Session of the American Medical Association, Minneapolis, June 14, 1928.

A B

Fig. 1.—Severe fracture of the bony portion of the nose. *A*, fractured dislocated end of the septum resulting in a marked refraction of the upper lip; *B*, the reconstructed lower end of the septum which lowered the upper lip.



A B

Fig. 2.—Girl, aged 12. *A*, the fractured dislocated end of the septal cartilage and slightly flattened left ala; *B*, the reconstructed end of the septum, the patent nares and the raising of the left ala.

Fig. 2.—Girl, aged 12. *A*, the fractured dislocated end of the septal cartilage and slightly flattened left ala; *B*, the reconstructed end of the septum, the patent nares and the raising of the left ala.

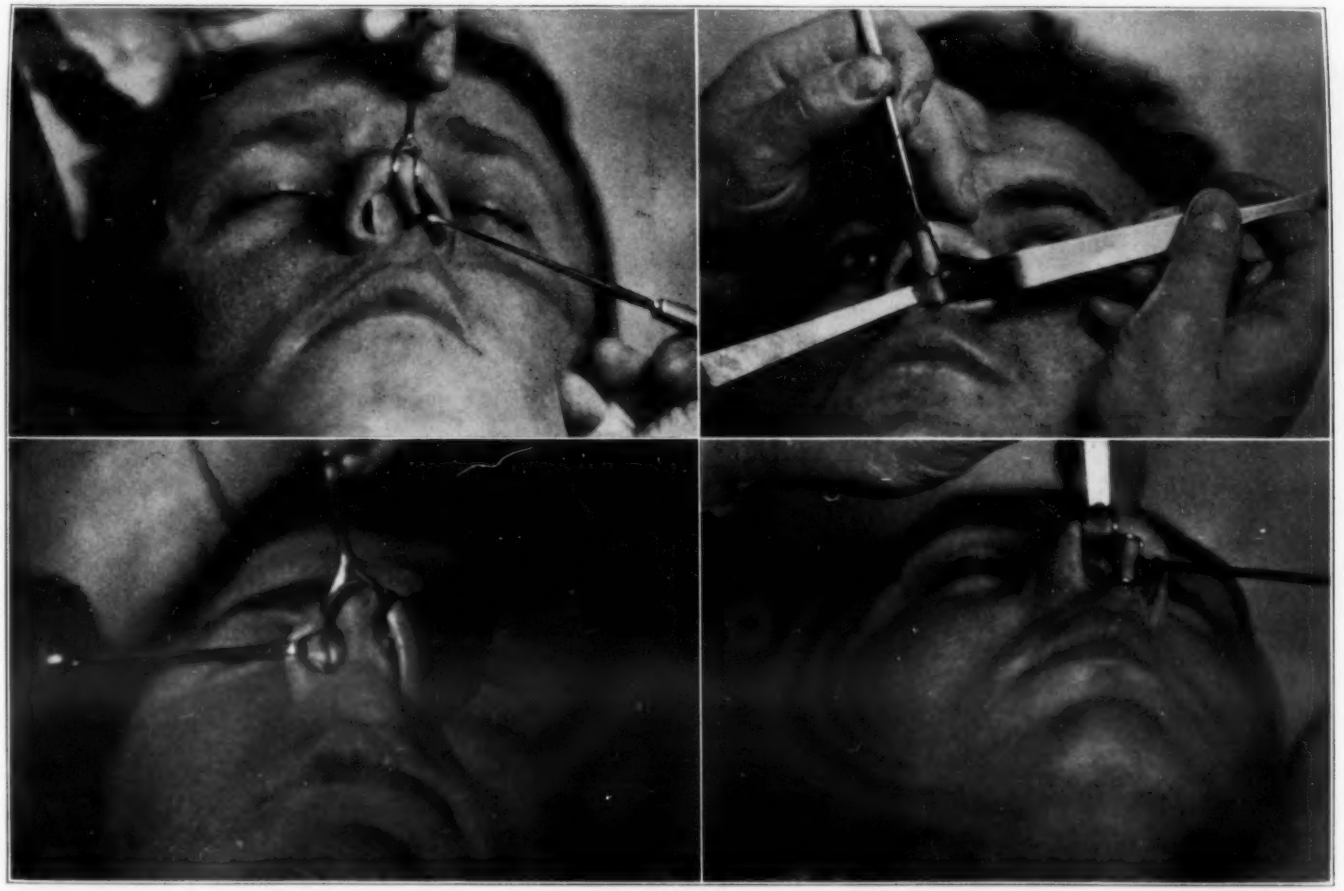


Fig. 3.—Four different types of fractured dislocated ends of the septal cartilage.

cumstances is the dislocated bone or cartilage routinely removed at any later time, as recommended in the case of the dislocated end of the septal cartilage.

If the fractured, dislocated end of the septal cartilage is not reset at the time of injury, it may be reset at any age in a child. The earlier the dislocated end of the septum is reset, and gives support to the drooping nasal tip and reestablishes patency to the nares, the more normally will the cartilage and the tip of the nose develop.

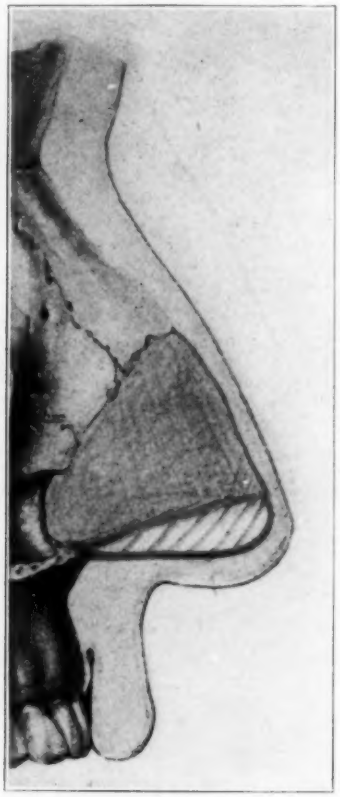


Fig. 4.—The striped lower end of the septal cartilage is the lower part of the septal cartilage which is usually dislocated. This lower end of the septum should never be removed in part or entirely. It should always be reset in its anatomic position to give support to the soft tissues of the nasal tip and to reestablish patency to the nares.

The cartilaginous septum is the main support of the soft tissues of the nose. The lower end of the cartilaginous septum is the sole support of the nasal tip, except for the narrow strip of cartilage in the columella. A submucous resection should not be performed for the removal of the dislocated cartilage at the nasal tip merely with the idea

of improving the nasal breathing, but every septal operation involving the cartilage of the tip should be planned with the idea of endeavoring to replace and reset the deviated or dislocated septal cartilage into its normal position.

The removal, by submucous resection, of the so-called dislocated or luxated end of the septal cartilage, which is readily visible at the entrance of the nares may, but does not necessarily, result in the establishment of patency to one or both nares; the removal of the dislocated cartilage may be followed by additional softening and drooping of the tip of the nose, which may add to the existing difficulty in breathing, so that the patient may develop the habit of raising or pushing up the tip of the nose

Fig. 5.—Plaster cast showing condition of a girl who sustained a fracture dislocation of the lower end of the septal cartilage in childhood. At the age of 16, most of the lower dislocated end of the septal cartilage was removed. This removed the support to the soft tissues at the tip of the nose. The scar contraction added to the downward pull on the tip of the nose so that a sharp angle was formed from the lower end of the remaining firm septal cartilage. The operation for the removal of the cartilage rendered the nares smooth but not patent, because the drooping nasal tip became a mechanical obstruction to the intake of air, and the patient was obliged to push up the tip of her nose so that she could breathe better.

to improve his breathing. When the lower end of the dislocated cartilage is replaced in its normal supporting position in the median line in the columella, the soft drooping tip is raised and stiffened, the nares again become patent and the breathing is permanently improved, as is the appearance of the nasal tip.

The position of the deflected lower portion of the septum, in relation to the tip of the nose, is analogous to a partially open door and its framework or casing, except that the casing of a door is rigid. For the purpose of illustration, one may imagine the septum as a door supporting a soft tissue framework or casing. As long as the door is closed, it gives support to the flexible casing; if the door is slightly open, the flexible casing will droop at the open end.

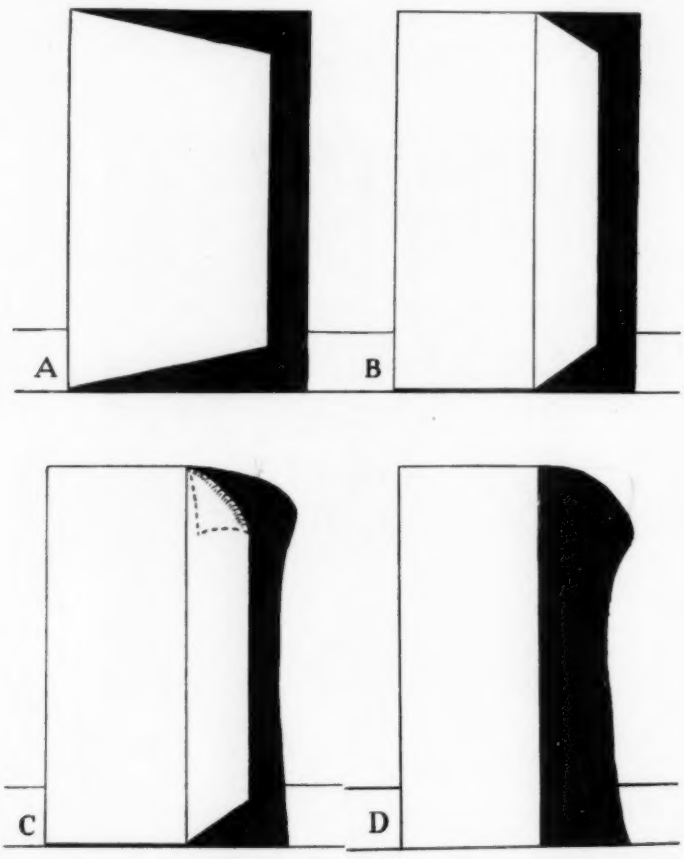


Fig. 6.—*A*, a door casement with the door partially open. *B*, a door casement with the door slightly open. *C*, a flexible casement with the door partially open but still giving some lateral support. The flexible casing droops in the one corner and its one edge becomes slightly concave. This is analogous to a dislocated end of the septal cartilage still giving lateral support to the nasal tip, with a slightly drooping nasal tip, somewhat beaked, and a slightly concave columella. *D*, the open portion of the door removed. This removes the lateral support to the flexible casing, so that the casing droops more than before and the one edge becomes more concave. This is analogous to the removal of a large portion or all the dislocated septal cartilage. The drooping of the tip of the nose is increased, it becomes more beaklike and the columella becomes more concave from below upward.

If the mechanical steps which caused the flexible casing to droop were the opening of the door, then reversing these mechanical steps, namely, closing the door under the flexible casing, will again give support to the flexible framework.

If the mechanical steps which caused the soft tissues of the nasal tip to droop were the dislocation of the lower portion of the septum from its normal position in the columella, in the vomer and underneath the

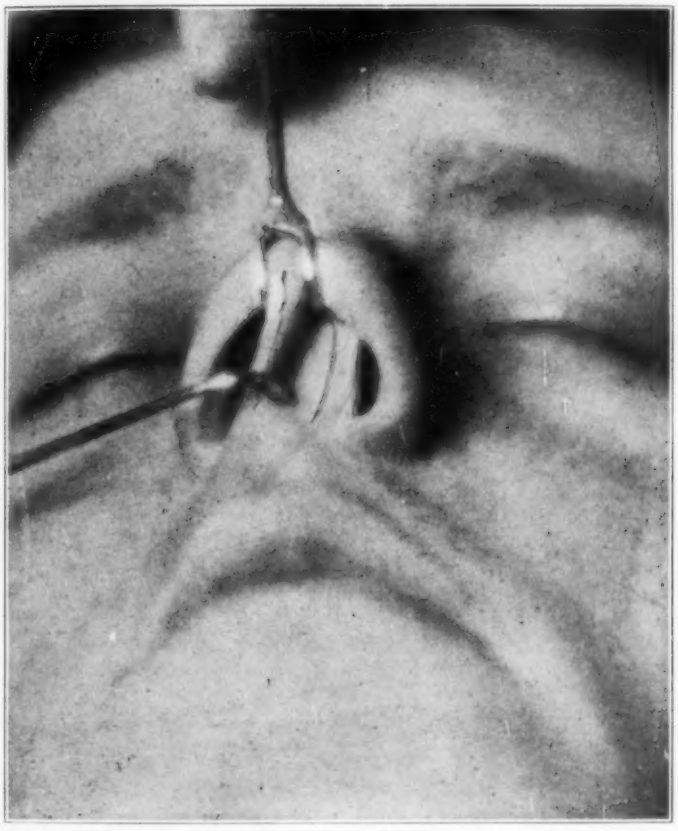


Fig. 7.—Fracture dislocation of the lower end of the septal cartilage, which appears like a partially open door, still supporting the soft tissues of the nose laterally. If the major portion (or all) of this deflected cartilage is removed by a submucous resection, the lateral support to the soft tissues of the nose is partially or totally removed, and the tip of the nose will droop. If this deflected cartilage is reset into a straight plane, the soft tissues of the tip of the nose are again supported and the patency of the nares is again reestablished.

nasal tip, then reversing these mechanical steps, namely, replacing the dislocated lower part of the septum in the columella and in the vomer will again raise the soft tissues and give support to the nasal tip.

The method for replacing the dislocated lower portion of the septal cartilage is that method by which the operator can best accomplish the results. First, it is necessary to establish a diagnosis to determine what portion or portions of the septum are out of alinement; then one must devise the best mechanical methods for the replacing of the septum and for the straightening out of the curvatures when they exist—by cross hatching the cartilage without removing any of the lower portion of the cartilaginous septum or removing only just enough cartilage to make it possible to replace the septum in a straight plane.

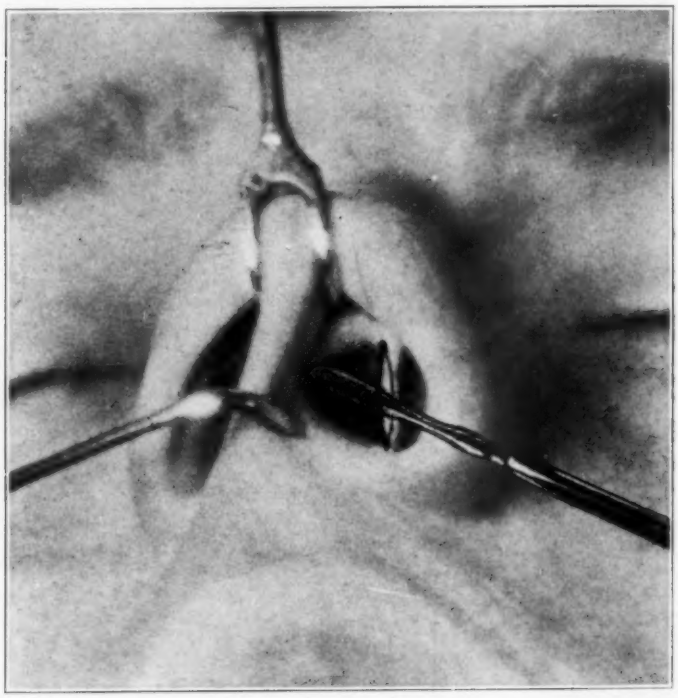


Fig. 8.—The incision along the free edge of the dislocated septal cartilage and the separation of the mucous membrane on the lower or anterior surface of the dislocated cartilage; which is really the mucous membrane from the opposite nostril separated from the cartilage up to the angle of deflection. The mucous membrane on the upper or posterior border of the dislocated cartilage, or the mucous membrane that lines the dislocated cartilage in the nares in which the operation is being performed, is not separated from the cartilage.

The dislocated lower portion of the septal cartilage may be replaced by a direct or straight method which I have practiced for ten years. Instead of making the usual submucous incision within the nares, the incision is made along the free edge of the lower border of the dislocated septal cartilage where it presents in the nares. The mucous

membrane on the side of the septum in which the operation is being performed is not separated from the portion of the septum which is deflected, but the mucous membrane which comes through from the opposite nostril is separated from the cartilage up to the bend, or what I choose to call "the angle of deflection of the cartilage."

It is this angle in the cartilage which keeps the lower end of the septum deflected across the nares. At the angle of deflection, the cartilage is incised to, but not through, the opposite mucous membrane, or it may be necessary to remove a narrow strip of cartilage parallel to the incision, so that the lower part of the cartilage can be straightened. The

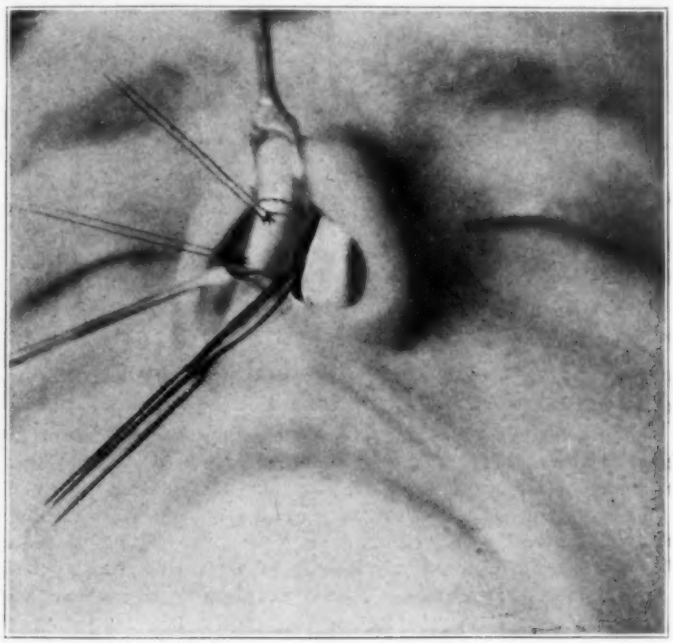


Fig. 9.—The mucous membrane on the under or lower surface of the septal cartilage is laid back to expose the angle of deflection of the cartilage. In the operation, the mucous membrane is simply retracted and not cut. Incision is made through the angle of deflection of the cartilage, but not through the mucous membrane. This may be sufficient to permit the straightening of the cartilage.

posterior border of the dislocated portion of the septum is separated from its attachments to the ridge along the floor of the nose but not separated from the mucous membrane in the nostril in which the operation is being performed. In order to force or spring the cartilage into the median line, one may find it necessary first to make a semblance of a groove in the vomer. The tissues just back of the columella are separated for the reception of the lower end of the dislocated cartilage. These procedures usually permit the replacement of the dislocated lower

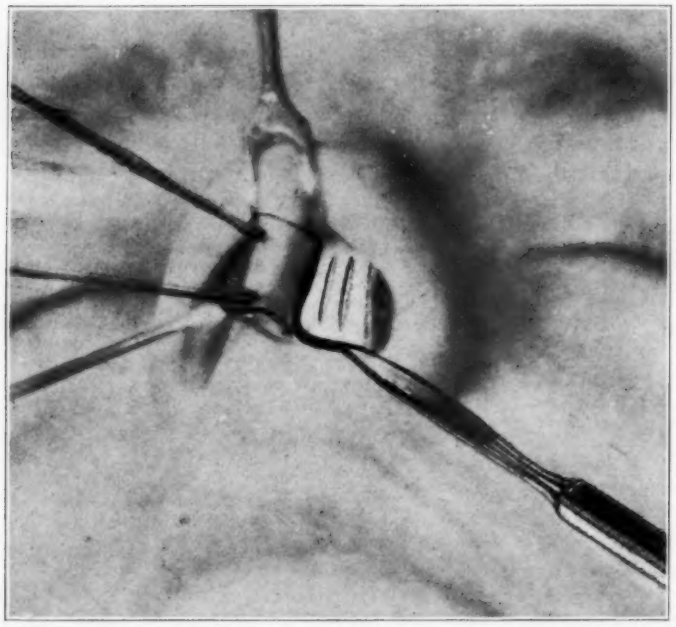


Fig. 10.—The mucous membrane of the lower or under surface of the septal cartilage is laid back to expose the angle of deflection of the cartilage. In the operation, the mucous membrane is simply retracted and not cut. Incision is made through the angle of deflection of the cartilage but not through the mucous membrane. This may be sufficient to permit the straightening of the cartilage. It may be necessary to continue this incision of the cartilage along the base but not through the mucous membrane. The two incisions usually permit the straightening of the cartilage. It may be further necessary to take the spring out of the cartilage by making several longitudinal incisions through the cartilage but not through the mucous membrane, or it may be necessary to cross hatch the cartilage. At the end of one or all of these procedures the dislocated end of the septal cartilage always remains attached along the upper border. The mucous membrane on the upper or posterior border of the dislocated septal cartilage, or the mucous membrane in the nares in which the operation is being performed, always remains attached to the cartilage and is never separated from it. By one or all of these steps, the cartilage is reset in the median line in a straight plane, the lower border of the cartilage fitting in between the separated tissues of the columella and held in place by a few sutures through the mucous membrane.

portion of the septum into the ridge in the vomer; into the columella, and underneath the drooping nasal tip, thereby raising the tip, giving it support and rendering both nares patent.

At the time of operation through the incision at the angle of deflection, any of the posterior part of the cartilaginous or bony septum or ridge may be corrected or removed as in the usual submucous resection. The deflected lower part of the septal cartilage below or anterior to the angle of deflection is not removed but is always reset in the median line to give support to the nasal tip and to reestablish patency to both nares.

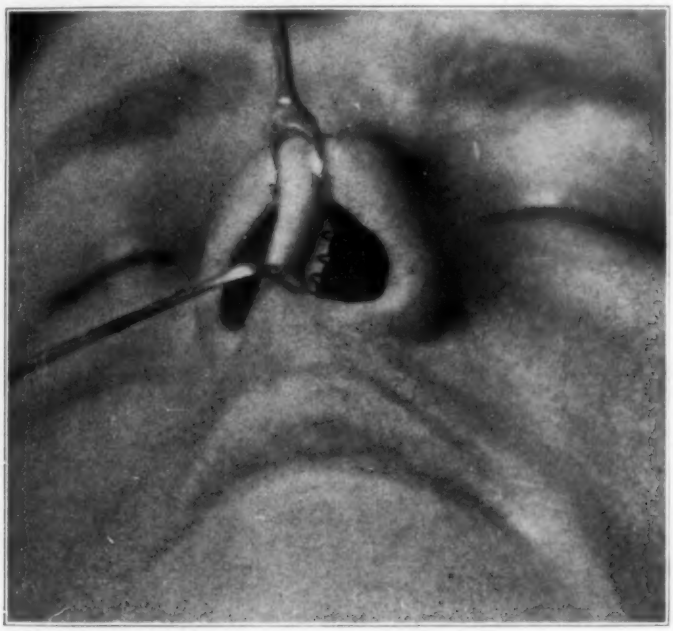


Fig. 11.—The dislocated septal cartilage reset. Sutures to close the mucous membrane incision.

SUMMARY OF THE PRINCIPLES IN A CASE OF A FRACTURED DISLOCATED LOWER END OF THE SEPTAL CARTILAGE

1. The cartilage is dislocated laterally from the groove in the vomer.

2. The cartilage is removed from the supporting position in the columella.

3. The cartilage is removed from the supporting position underneath the soft tissues of the nasal tip.

4. These changes at the end of the septal cartilage result in a drooping of the nasal tip so as to form a slight beak and render the columella slightly concave from below upward.

5. On the side of the lateral deflection of the cartilage, the ala and the nostrils are slightly widened.

6. The opposite ala is slightly flattened on top and the nostril somewhat narrowed.

7. The deflected cartilage causes a partial or nearly total obstruction to this one nostril.

8. In the other nostril, there is a rather sharp angle of deflection of the cartilage resulting in a partial or nearly total obstruction of this nostril.

Fig. 12.—*A*, cast made before operation, showing the drooping of the tip of the nose due to the dislocation of the lower end of the septal cartilage. *B*, cast made after operation, showing the tip of the nose after the dislocated lower end of the septal cartilage has been reset, thereby establishing patency to both nares and raising the tip of the nose.

SUMMARY OF THE RESULTS FOLLOWING THE REMOVAL OF PART OR ALL OF THE DISLOCATED END OF THE SEPTAL CARTILAGE

If, by a submucous resection, the major portion (or all) of the deflected lower part of the septal cartilage is removed, then part or all of the lateral support given by the deflected cartilage is removed, with the following results:

1. A sharp angle is formed by the drooping of the soft tissues at the lower end of the remaining septal cartilage.

2. The nasal tip comes closer toward the upper lip.

3. The nasal tip becomes more beaklike.

4. The columella is rendered more concave from below upward.

5. The contraction of the scar tissue from before backward pulls the nasal tip downward in an irregular manner from 3 to 5 mm. within a few months

6. The median wall is made smooth, but the nares are not rendered patent, because the change in the position of the drooping nasal tip interferes mechanically with the intake of the air and renders nasal breathing more difficult; hence, the patient frequently resorts to raising of the tip so he can breathe better.

SUMMARY OF THE RESULTS FOLLOWING THE RESETTING OR RECONSTRUCTION OF THE LOWER END OF THE DISLOCATED SEPTAL CARTILAGE

If, instead of removing the dislocated lower end of the septal cartilage by a submucous resection, the cartilage is reset in the groove in the vomer, restored to its former supporting position in the columella and replaced underneath the soft tissues of the nasal tip:

1. The lower end of the dislocated septum will be brought into a straight plane.

2. The columella will be stiffened.

3. The soft tissues of the nasal tip will be supported.

4. The depressed nasal tip will be raised.

5. Both nares will be rendered patent.

6. The nasal breathing will be reestablished.

7. The tip of the nose will assume a dignified appearance.

8. In children, the lower end of the septum and the nasal tip will develop normally.

731 Rose Building.

DISCUSSION

DR. H. D. LEMERE, Omaha: About four years ago, Dr. Bannister described an operation for this condition. Dr. Metzenbaum's paper covers the different conditions and their indications for this operation completely. As he says, it is an operation that can be done on children, and is often indicated when the ulceration is not severe and when the deformity is of moment to the children. Dr. Bannister's operation is not just the same as Dr. Metzenbaum's, although I judge both operations would be equally efficient. Dr. Bannister's is done on the convex side of the nose—Dr. Metzenbaum's on the concave side. He makes the incision as Dr. Metzenbaum does, but, instead of putting in sutures, he makes a

culdesac to hold the plate without any sutures. I have practiced this procedure and find it efficient. I am certain that Dr. Metzenbaum's operation would be easier to perform than Dr. Bannister's.

DR. MYRON METZENBAUM: In cases of fracture in this location, or of some other cartilage of the body, one should always try to set it as soon after injury as possible. There is no reason for removing such cartilage or bone at a later time unless there is positive indication for it. There is no reason why this fractured and dislocated portion of the septum should not be replaced rather than removed when the child reaches the age of 16 or 18. It will help the development of the tip of the nose, and it is quite as simple an operation as an ordinary submucous resection after it has been done a few times.

OSTEOMA OF THE FRONTAL SINUS*

JEFFERSON BROWDER, M.D.
BROOKLYN

Tumors of bony cavities which are considered benign in that they do not invade by cellular extension often destroy surrounding structures by pressure erosion. This generality holds true for the slow-growing benign tumors of the nasal accessory sinuses and for the osteomas in particular. These rather rare growths, because of their situation, not infrequently present surgical problems of considerable magnitude.

It is uncommon in this surgical age to encounter a pedunculated osteoma of the frontal sinus which has grown to such an enormous size as in the instance reported. Of added interest in this case is the formation of a mucocele secondary to occlusion of the frontonasal duct.

It is the purpose in this report to record an example of an osteoma of the frontal sinus which was successfully extirpated by a slightly different approach from any previously described.

REPORT OF CASE

History.—L. I. C. H., a schoolboy, aged 16, entered the hospital on March 16, 1927, complaining of a lump on the forehead. The right eye had recently become swollen and painful. The boy was first seen in the opthalmologic section of the outpatient department in August, 1926, by Dr. Behan. With the aid of roentgen examination, a diagnosis of osteoma of the frontal sinus was made, and the patient was advised to enter the hospital for operation. He did not return and was lost sight of until the day of entry.

The patient had always been active and healthy, except for the occurrence of measles at the age of 2 years and "rheumatism" at the age of 10. His tonsils were removed when he was 8 years of age. About two and one-half years before admission, he noticed a small, painless, hard lump just above his left eye, which grew progressively larger over a period of three months and then became stationary. At about this time, he noticed that he "saw double" unless he tilted his head backward when looking at an object. The condition remained as described until December, 1926, when he began to have pain in the center of the forehead.

When he examined himself in a mirror, he found that the lump on the left side had extended over past the midline to the right. From this time, the "growth" extended rather rapidly and seemed to displace the right eye downward, thereby correcting the double vision which he had previously noticed. One week before entry the right eyelid became swollen and red, but there was no tenderness, and he did not think that there was any fever. There was no associated discharge from the nose. He had never had headache or disturbance of acuity of vision, and he had not vomited.

* Submitted for publication, Nov. 28, 1928.

Physical Examination.—The patient was a well developed boy who looked at the examiner with his head tilted backward. The head was not unusual, with the exception of the forehead and the eyes. There was a distinct fulness of the lower half of the forehead, particularly in the center and just to the left of the midline. In the upper inner quadrant of the left orbit, a knoblike projection of this mass was palpable, extending into the orbit and displacing the left eye downward and slightly outward. On the right side, the supra-orbital ridge was smooth and apparently not raised. There was tenderness at its midpoint on firm pressure. The right lid was swollen and pale red. The slit was almost completely closed. Surface heat was not increased. When the lid was raised, the right bulb was seen to be distinctly displaced downward and slightly inward. The vision in both eyes was 20/20. The fundi showed nothing unusual. The veins were not prominent. There were pupillary changes. The extra-ocular movements on the left were well performed, except for the upward movement, which was markedly limited.

Fig. 1.—Photograph taken two weeks before the operation, showing the downward and outward displacement of the left eye and the edematous and red, upper lid of the right eye.

On the right, the movements were well performed, except upward rotation, which was limited but not as noticeably as on the left. The blood pressure was 112 systolic and 86 diastolic. The radial pulse was 84. The patient answered questions quickly and intelligently. The results of the remainder of the examination were unimportant.

Laboratory Examination.—Examination of the blood revealed: red blood cells, 5,200,000; hemoglobin, 84 per cent, and white blood cells, 7,200. The results of the urinalysis were negative. The Wassermann reaction of the blood was negative.

Roentgen Examination.—Stereoscopic examination of the skull in the anteroposterior view showed a dense shadow in the region of the frontal sinus, almost completely filling the left sinus and extending downward into the left orbit, the roof of which had been eroded. The mass extended across the midline to the right, sending a projection downward into the right ethmoid region. The outline of this dense shadow had a lobulated appearance. That portion of the sinus on

Fig. 2.—Anteroposterior view of the tumor. In figures 2 and 3 the absence of outline of the right frontal sinus due to mucocele should be noted.

Fig. 3.—Lateral view of the tumor.

the right which was not filled with tumor, had a hazy appearance, but the cell outline could be seen. In the lateral view, a backward projection like a knob was noted at the upper aspect of the dense shadow. The skull was eroded at this point.

Because of the redness and swelling of the right eyelid, it was thought advisable to await developments as there was danger of infection being present. After three weeks, however, the condition remained unchanged; so an operation was decided on.

On April 8, 1927, with the patient under ether anesthesia, a circumlinear incision was made, beginning in the left anterior temporal fossa and extending across the forehead at the hairline to the corresponding point on the right. The entire flap, including the periosteum, which was preserved with care, was reflected downward, exposing the frontal region of the skull. At several points the lobulated surface of the tumor had perforated the anterior wall of the frontal sinus. After removing the thin external shell of bone, the stony hard mass was fractured from its

Fig. 4.—Photograph taken six days after operation. The position of the almost completely healed incision should be noted.

attachment in the region of the left ostium frontale. The left supra-orbital region had been completely destroyed by pressure erosion. On the right, the portion of the sinus that had not been filled by tumor contained a gluey, mucoid material. After washing this away, a much thinned-out roof of the orbit and a small opening which communicated with an orbital fossa sac were found; the latter undoubtedly was the cause of displacement of the right eye. Posteriorly, the dura was exposed by pressure erosion of bone over an area about 1 cm. in diameter. The dura itself had a normal appearance and was not attached to the tumor. The wound was closed with layer silk. Cultures of mucoid material were taken.

The postoperative course was uneventful except for the fact that every time the patient attempted to blow his nose the entire operative area became inflated. By pressure over the forehead the air escaped through the right frontal ostium, which was widely patent. The patient was discharged on the tenth day after the operation.

Laboratory Examination.—Cultures did not show any growth after four days.

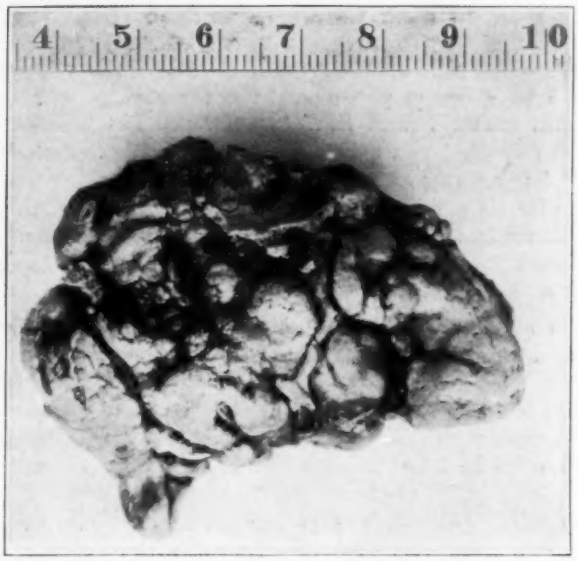


Fig. 5.—Gross appearance of the tumor showing the projection on the right into the ethmoid region. This can be seen in the roentgenogram.

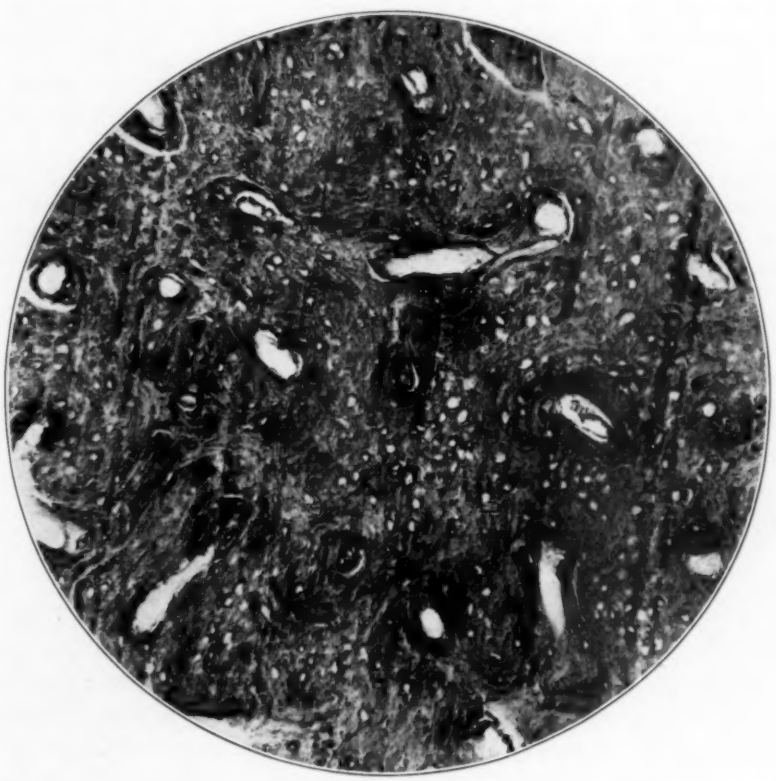


Fig. 6.—Photomicrograph of the tumor; reduced from a magnification of $\times 80$.

The pathologic specimen examined consisted of an extremely firm, lobulated tumor 6.5 by 5 by 4 cm. in dimension. The convolutions were grayish-white, whereas the sulci contained small fragments of rather soft bone and blood clots. There were two rather prominent areas; one tongue-like which extended downward from the right lower corner and one knob-like on the left upper posterior aspect. At the lower edge about the midposterior part was a roughened area 0.6 cm. in diameter, which apparently was the bony attachment of the mass. Microscopic examination showed a dense compact bone with many tortuous, irregular-shaped haversian canals.

Examination Three Months After Operation.—The patient reported for examination three months after operation. He had been attending school and felt well in every respect. There was a moderate concavity in the lower frontal region, especially on the left side, where the eye seemed to be more prominent owing to the absence of the supra-orbital ridge. Vision was normal. The ballooning of the frontal region when he blew his nose disappeared about one month following operation.

Second Admission.—On Oct. 1, 1928, eighteen months after the operation, the patient returned because of a painful swelling just above the right eye. This had been present for ten days and was slowly growing worse. The patient said that so far as he knew, fever had not been associated with the condition.

Examination revealed a fairly well circumscribed area, about 2 cm. in diameter, just above the middle part of the right supra-orbital ridge, which was red, tense and very tender. The upper lid of the right eye was red and edematous. There was no disturbance in vision. The optic fundi showed nothing unusual.

Roentgen examination revealed a most interesting reconstructed frontal area which represented a frontal sinus. On the right, there was a separate compartment which was hazy in outline.

Second Operation.—On Oct. 3, 1928, with the patient under ether anesthesia, an incision was made through the right brow exposing the medial, roughened, bony edge covered with scar tissue. When this was dissected away, there was a free gush of a gluey material coming from a portion of the old sinus where the anterior wall had not been removed. The bony covering of this cavity was rongeured away and careful search made for a tract which had previously drained the secreting area, but none could be found. The lining membrane of the mucocele cavity was thoroughly destroyed, and the wound was closed with a small drain at one angle.

The postoperative course was uneventful. There was primary healing of the wound. The patient was discharged on the fourth day.

Culture of the material obtained from the cavity did not show any growth after four days.

COMMENT

Because of the disturbance of vision, it is the ophthalmologist who is primarily consulted by patients with osteomas of the accessory sinuses of the nose. Previous to the advent of x-rays, only those osteomas that had eroded the wall of the cavity in which they were growing were brought to the attention of the surgeon. Even now it is doubtful if

Fig. 7.—Photograph taken three months after operation. The absence of the left supra-orbital ridge can be seen.

Fig. 8.—Anteroposterior view of the frontal area eighteen months after operation, showing the reconstructed frontal sinus and the hazy area over the right orbit representing the recurrent mucocele.

any great importance would be attached to the discovery of a small osteoma during the course of a roentgen examination of the sinuses. If the examiner is alert to the many grave complications that may arise, however, it is his duty to warn the patient and to follow the progress of the growth if possible. As in the case of all tumors, early extirpation is the procedure of choice.

In many instances the question of operative approach is of paramount importance, and on this depends the possibilities of postoperative complications. Previous to 1918, there were no instances on record in which the surgeon approached an osteoma of the sinus other than from the orbit or through some type of Killian incision. In December, 1918, in the National Hospital, Armour [1] successfully removed an ivory exostosis by turning down a frontal bone flap, thereby approaching the lesion from above. Cushing [2] also recorded his experiences with four somewhat similar cases in which the growth was removed by osteoplastic frontal bone flap. Both of these surgeons were dealing with ethmoidal tumors that had invaded the anterior cranial fossa by pressure erosion. In the instance herein recorded it was necessary to reflect only the soft parts over the frontal region, since the tumor had already destroyed the anterior aspect of the frontal sinus. Even though the latter should not have been the case, some such type of approach would have been the only logical method for removal of a mass of this size.

Osteomas of the accessory sinuses are, as a rule, composed of a central portion of cancellous bone with an outer layer of compact bone. They may, however, be made up entirely of compact bone with tortuous haversian canals, as in this case. In some instances, as described by Tillman,[3] the tumor becomes detached from its pedicle, and, since its blood supply has been cut off, becomes a grayish, ivory colored mass. There are no cases on record in which these benign growths have taken on malignant characters.

While an osteoma is growing in an accessory sinus, the mucoperiosteal lining of the sinus is undergoing changes which may in some instances cause more concern than the tumor itself. This mucous lining normally secretes a small amount of thin mucoid material which is discharged through an ostium into the nasal cavity. In case this opening

---

1. Lang and Armour: Ivory Exostosis Growing from Roof of Frontal Sinus, Proc. Roy. Soc. Med., 1918-1919, vol. 12.

2. Cushing, Harvey: Orbito-Ethmoidal Osteomata, Surg. Gynec. Obst. **44**: 721, 1927.

3. Tillman, J.: Ueber todte Osteome der Nasen und Stinubohle, Arch. f. klin. Chir. **32**:677, 1885.

is occluded, the secretion collects in the sinus cavity, becomes concentrated and is of a thick, gluey consistency. This is the so-called mucocele. Cases are also reported in which a portion of this lining membrane becomes pinched off from the main cavity by a growing tumor and develops a mucocele of considerable size (Cushing [2]).

Contrary to what one would expect, mucocele secondary to osteoma of a sinus is a rarity. In case the ostium frontale has been occluded, the retained secretions cause few if any symptoms until the thin roof of the orbit is eroded by pressure and an intra-orbital sac is formed, which presses on the bulb and causes diplopia.

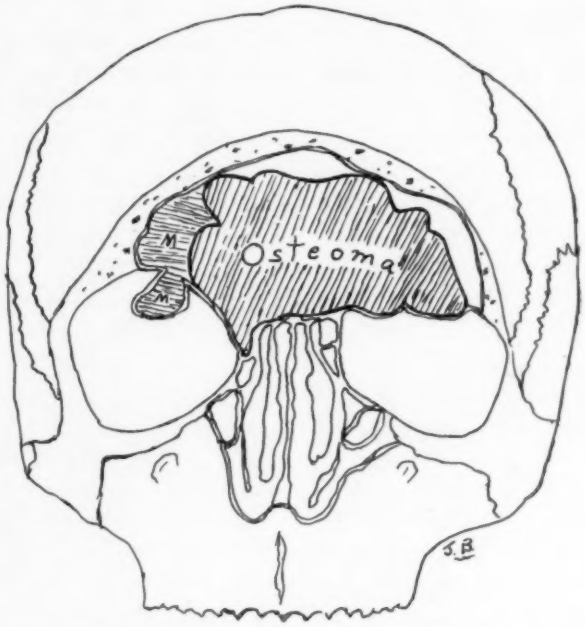


Fig. 9.—Operator's conception of the size and position of the mucocele.

These bony tumors have rounded edges and probably seldom send off a projection of the proper size to occlude completely the normal opening for drainage.

Reformation of a frontal sinus after the anterior wall had been completely destroyed is an unusual occurrence. From the shape of this sinus, as shown in figure 8, and the appearance of the inner cavity of the nose, it is assumed that there is drainage through the left frontonasal duct. The mucocele on the right that required a secondary operation was probably due to the gradual occlusion of its drainage duct by cicatricial tissue.

SUMMARY

1. A case of osteoma of the frontal sinus of unusual size, complicated by a mucocele has been presented.

2. The case is unique from the standpoint of bilateral displacement of the eyes by two entirely different types of tumor masses.

3. A reformed frontal sinus is visualized.

4. A surgical approach to the frontal sinus is suggested.

174 Clinton Street.

AN UNUSUAL CASE PRESENTING FOURTEEN UPPER MOLAR TEETH *

GEORGE C. SAUNDERS, M.D.
Fellow in Otolaryngology and Rhinology, The Mayo Foundation
AND
GORDON B. NEW, M.D.
ROCHESTER, MINN.

The anomaly of supernumerary teeth has been noted by some of the earlier writers, but cases have not been carefully studied or classified until within the last twenty years.

Supernumerary teeth may be defined as those in excess of the normal number of twenty in the deciduous dentition or in excess of thirty-two in the permanent dentition. If there are more teeth than the regular number, of one type, such as incisors or molars, these extra teeth may be classed as supernumerary. This anomaly is not to be confused with the presence of extra teeth, which really are normal teeth of the former dentition. There is no embryologic evidence to show that there are any dentitions in man other than the two mentioned.

Supernumerary teeth are common in animals; the higher animals have them less frequently than the lower forms. They also are common in primitive man. In present-day man, the occurrence of this phenomenon is about 1.2 in each 1,000 persons, and supernumerary upper teeth exceed supernumerary lower teeth in the ratio of 6:1. The frequency of incisors, molars, premolars and canines is in the order in which they have just been named. Extra teeth are found in the permanent dentition twice as frequently as in the first dentition.

Supernumerary teeth usually are less strongly built than those of the normal dentition, and they usually develop at one side of the normal arch. Sometimes, however, they crowd out the normal teeth. They may erupt at the normal time for the dentition to which they belong; but sometimes they are delayed by impaction or for the same reason that causes delay in eruption of the normal teeth.

Cases of as many as eight incisors and nine bicuspids in one jaw and cases of as many as four molars in one side of one jaw have been reported. A survey of the literature fails to show a case similar to the one reported in this paper. Bumm [1] reported a case of double maxilla, but in his patient the two jaws were complete and lay side by side, as

* Submitted for publication, Jan. 7, 1929.

* From the Section on Laryngology, Oral and Plastic, The Mayo Clinic.

1. Bumm, Erich: Ein Fall von Verdoppelung des Oberkiefers, Arch. f. klin. Chir. **135**:506, 1925.

two separate arches. He cited a case reported by Meyer in which a similar anomaly was found in the lower jaw. In the early case reported by Diserabode, there was said to be a complete double set of upper teeth with a total of forty. This, however, is probably apocryphal, or it may have been a case of mixture of teeth of both dentitions.

In dental journals up to 1907 a total of 58 cases of supernumerary teeth were reported, and in 1909, Black [2] reported an extensive study of the condition from a collection of more than 200 cases. In 1927, Gottardi [3] reported 80 cases and reviewed studies made on the etiology of the anomaly.

There are two theories of the origin of the condition. The theory of atavism often has been advanced, and Gottardi assembled and discussed all such theories in his long article. Man has the following dental formula: incisors two, canines one, premolars two and molars three; primitive animals have the formula: incisors three, canines one, premolars four and molars three. The arguments advanced in favor of the atavistic theory are based on consideration of: (1) site of the teeth, (2) morphology, (3) hereditary transmission, (4) presence in animals and (5) reduction in number in present-day man, which is questioned by many.

In contradiction to these arguments, it is shown that the teeth last to be lost in evolution are not those which most frequently appear as supernumerary teeth. Although supernumerary canine teeth have been noted, they are extremely rare. It also has been shown that more teeth of one type have been found in certain cases than can be found in any animal, living or fossil. Extra germ buds have been found in the molar area in which there is no evidence of loss of teeth in evolution. On the basis of morphology, conoid teeth, which appear at the present day, have been assumed to be atavistic, but for this to be so it would be necessary to assume that nature had jumped back several million years to find the type in reptiles and similar animals. This view is so extreme as to exceed all probability. It has been shown further, to controvert the theory of atavism, that the supernumerary teeth often have forms resembling the teeth of the present day and not those of ancient times. Similar anomalies of supernumerary organs, such as polydactylism, cannot be explained on the basis of atavism.

Gottardi concluded that the most probable theory is that the supernumerary teeth are the result of hyperproductivity of the dental lamina. This hyperproductivity itself may be an atavistic phenomenon, but the formation of the individual teeth is due to the developmental factors

2. Black, G. V.: Supernumerary Teeth, Dental Summary **29**:1, 83, 1909.

3. Gottardi, C.: I denti soprannumerari nell'uomo, Stomatol. **25**:6, 126, 205, 1927.

present in the individual case. Supernumerary teeth are found more frequently in persons who show signs of myxedema or cretinism than in others.

Black discussed the origin of supernumerary teeth from the embryologic standpoint. According to his studies, these teeth may arise in one of two ways: by budding, and from whorls of epithelial cells.

In budding, teeth may develop from supernumerary buds that are given off by the band of epithelium which also gives rise to the normal teeth. Supernumerary teeth may also develop from the cords of buds from which normal teeth are formed.

In development from whorls, the epithelial cords and the original epithelial lamina, which perform functions in the development of normal teeth, eventually break up. The whorls of epithelial cells which form at this time may fail of absorption and may persist; if this occurs, supernumerary teeth may form from the whorls. The teeth which develop from whorls are apt to be simple or multiple conical forms in which develop dentine germs, dentine pulp chambers and canals. Whorls which come in contact with the dentine germ of a normal growing tooth and develop enamel attached to that tooth or to another supernumerary tooth are said to be parasitic or enamel-drop in type.

The enamel-forming epithelial cells are the true tooth germ and control the formation of the dentine germ of the connective tissue. Enamel germ, in starting its growth in the midst of the connective tissue of the forming jaw, excites the formation of a dentine germ wherever the enamel germ may occur. Dental papillae may arise from any part of the dentinal sheet of tissue with which the epithelial mass comes in contact.

Supernumerary teeth have been classified in numerous ways. Black classified them according to the forms of the erupted portion and according to the condition of the roots. The erupted portion may be a simple conical crown or broken cones. According to the condition of the roots, the teeth may be free, fused with other teeth, buds from other teeth or double teeth. These types are further classified into thirteen specific groups of a more technical nature. By one classification, the teeth are grouped as (1) supplementary or normal in form or (2) supernumerary or irregular in form. By another classification, they are grouped as (1) conical, (2) tuberculated or (3) normal. Gottardi prefers the following classification: (1) conoid teeth, single roots and smaller than normal; (2) tuberculated teeth, multiple cones which may be several fused conoid teeth, atypical in form; (3) infundibular, conoid teeth in which the sides are concave, and (4) supplementary teeth, normal in form, also called duplicate teeth.

Fig. 1.—Asymmetry of face and protrusion of upper teeth in patient with eight supernumerary molars in the upper jaw.

Fig. 2.—Appearance of interior of mouth, showing position of supernumerary molars.

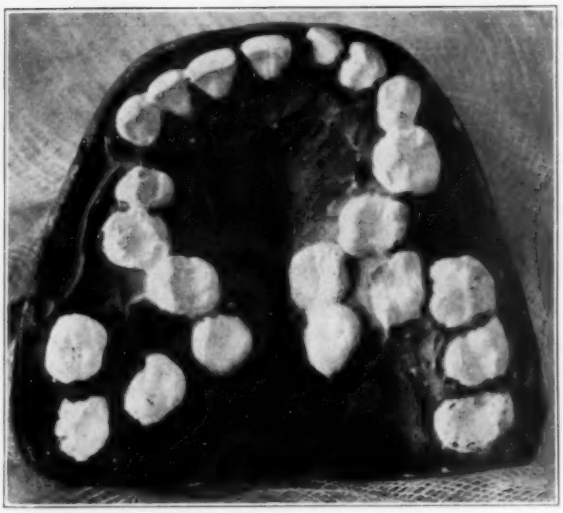


Fig. 3.—Cast of upper denture and roof of mouth, showing six molars on the right and eight on the left. The cast has been stained to permit clearer photography.

Fig. 4.—Cast of upper and lower dentures, showing protrusion of all upper incisors and canines.

Treatment consists in extraction in early childhood to prevent the deformity which may arise if the extra teeth are allowed to remain. If the supernumerary tooth is normal in shape and in better position than the normal tooth, it may be better to sacrifice the normal tooth and to retain the supernumerary one. In all cases, careful roentgenographic studies should be made before extraction is attempted. If a supernumerary tooth is fused with a normal tooth, it is unwise to attempt extraction.

REPORT OF CASE

A man, aged 29, a laborer, born in Illinois, entered The Mayo Clinic on Aug. 13, 1928, to ask advice concerning the possibility of cosmetic improvement of his face.

The family history was negative so far as could be determined. The deformity had been present since birth. When the patient was 3 weeks old, an operation had been performed which had left scarring at both angles of the mouth. It is not known whether this operation made any change in his condition. There had been no treatment since that time, except the extraction of several teeth from each side. His general health was good.

The patient had a grotesque, asymmetric face. The left eyelid could not be elevated more than half the normal distance. Vision in the left eye, however, was good. There was deformity of both zygomatic processes, and a small discharging sinus was noted in the right zygomatic region. Scars were present at the corners of the mouth and extended well up on the cheeks. There was a partial paralysis of the right upper lip. The chief variation was in the maxillae. The upper teeth protruded markedly. The palate was highly arched, and the molar teeth were arranged in a formation somewhat resembling a buckled, curved line. The total number of teeth remaining in the upper jaw was twenty-two. There were eight molars on the left side and six on the right. All of these teeth were of normal size and of normal conformation. Occlusion was extremely faulty; all upper teeth anterior to the premolars protruded beyond the lower incisors. Roentgenographic studies revealed the fact that the teeth were all separate at their roots. Only one typical premolar was found on each side. The lower teeth were normal. The tonsils and uvula were large. Results of examination by posterior rhinoscopy and laryngoscopy were negative. Externally, the nose appeared considerably deformed and misplaced, but evidence of anomaly was not noted by anterior rhinoscopy.

The patient was advised to have the supernumerary molars extracted, but he decided to return home and consider the matter (figs. 1 to 4).

SUMMARY

The unusual case of a patient with eight supernumerary molars in the upper jaw is presented. This offers further evidence against the atavistic theory of the origin of such teeth, since no animal, living or extinct, has as many molars as were found in this case.

Clinical Notes

AN OPERATING AND VISUALIZING SINUSCOPE

Preliminary Report *

SAMUEL MORSE, M.D., NEW YORK

I have felt the need of an instrument which would be useful in visualizing the openings of the various sinuses, and in probing them under direct vision, although I realize that rhinolaryngologists are overburdened with armamentarium. I also thought that it would be feasible to insert such an instrument within a sinus like the antrum or sphenoid.

There have been, to my knowledge, only two instruments which have made a step toward progress in this direction. In the antrascope of Dr. Speilberg the principle of the nasopharyngoscope was applied to a cannula, and one was able to insert the instrument into the antrum and to visualize at right angles only. This instrument did not have any operating possibilities. Another instrument, the account of which was published in *Laryngoscope* by Dr. Maltz which was an improvement over Spielberg's instrument, had a little more than right angle vision (20 per cent) and had the advantages of a narrow lumen. This also did not have any operating possibilities.

The manner of development and actual use in my practice, particularly in disease of the sinus will be enlarged on in an article which will follow this preliminary report. This is now in the course of preparation.

The practical uses for the instrument are viewing, probing and instilling the sinus orifices, thorough eradication of chronic ethmoiditis and polypi, making strong topical applications directly under view and visual implantation of radium in the eradication of chronic polypoid degeneration.

In the treatment of patients with intractable disease of the antrum, the instrument may be inserted into the cavity through its accessory channel, or it may be used through a permanent opening made by one of the usual instruments for that purpose. It can be used repeatedly through this opening for injection of fluids, fulguration within the cavity and for removal of polypoid masses, with an instrument similar to the dental broach which I have had prepared for me and which I have used experimentally on other polypi with satisfactory results.

The instrument has proved of great value to me because of its "direct in line vision," in postnasal work, making possible the recognition of the origin of postnasal discharge, old unhealed ulcers resulting from the removal of adenoids, and a good view of adenoid masses and hypertrophy of the posterior tip of the inferior turbinate. These areas may be treated or operated on with the instrument in situ, as, for example, by fulguration, by radio knife work and by snare.

The instrument may also be of value in attacking the hypophyseal tumor through the nasal route according to the method of Cushing.

The outstanding features of the instrument are: 1. There is a visualizing prismatic arrangement of its almost flylike eye so that one looks forward and to the sides with the light in front; in fact, one sees through the light. This principle is adapted from the McCarthy panendoscope but is modified to suit the purpose. 2. A large field may be seen in a small area or a small field in a large area, according to the distance of the end of the instrument from the spot viewed.

* Submitted for publication, Nov. 19, 1928.

* Presented at the Laryngological and Rhinological Section of the New York Academy of Medicine, Feb. 23, 1927.

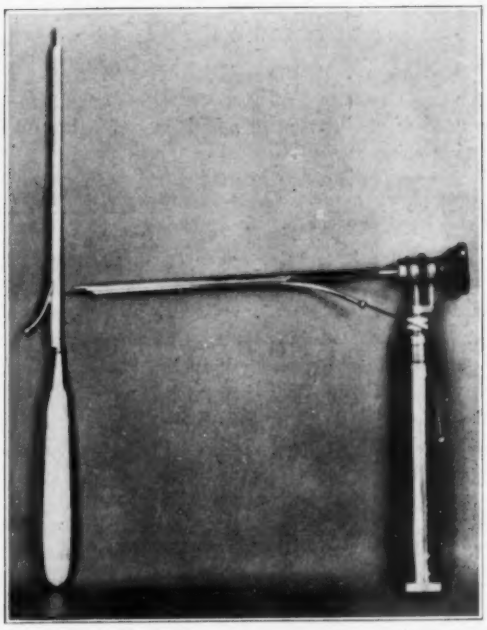


Fig. 1.—The instrument on the left is the antrum trocar in sheath; that on the right, the sinuscope in sheath.

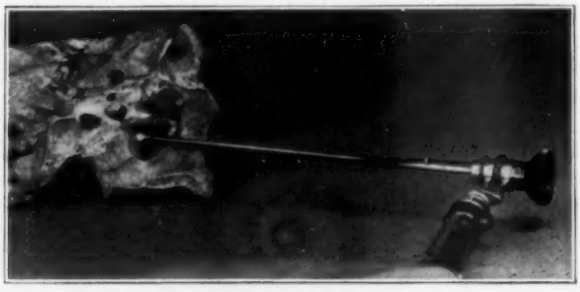


Fig. 2.—Instrument with sheath in antrum.

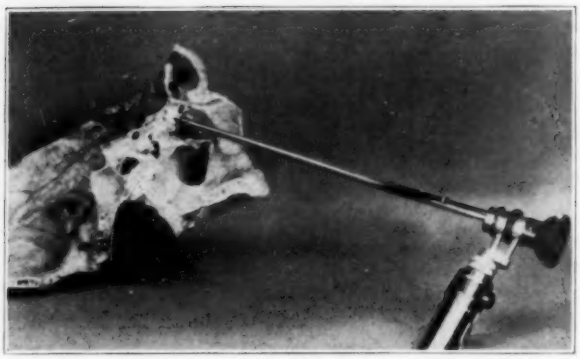


Fig. 3.—Sinuscope viewing ethmoidal area. This instrument is used in preoperative and postoperative ethmoiditis and for implantation of radium.

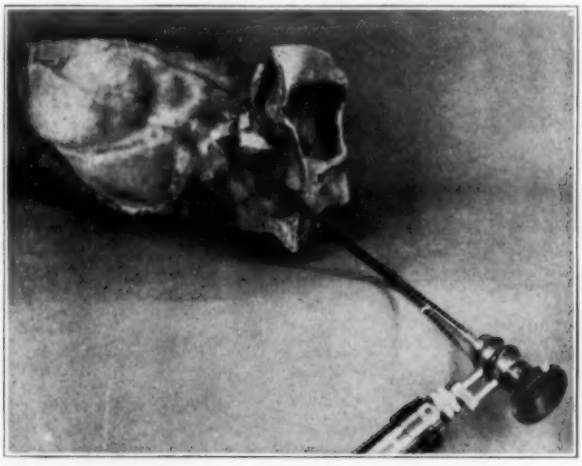


Fig. 4.—Oblique view illustrating instrument in postethmoidal area used for location of postnasal conditions and for probing sphenoids.

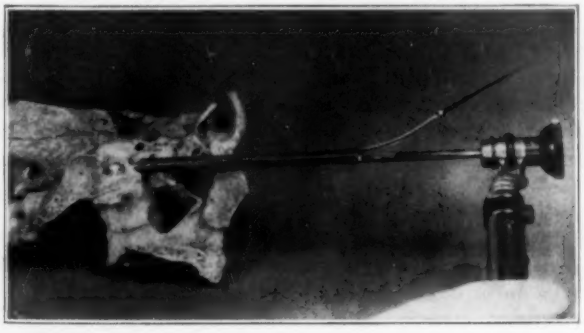


Fig. 5.—Sinuscope in sphenoid through an enlarged natural opening.

3. The displacement of the area may be viewed up or down or laterally, by rotating the tube without moving the instrument up or down. 4. An erect image is presented. 5. Cold illumination with a porcelain tipped bulb is used to prevent injury to the tissues. 6. The instrument may be revolved within the sheath to get the operating instrument into view. 7. There are: a trocar attachment for entering the antrum, with the sheath, operating instruments, catheter, fulguration electrode for fulguration, cutting or zinc ionization within a cavity, probes, broaches and rasps. The two latter are being perfected. With the snare attachment hypertrophy of the posterior tip of the inferior turbinate may be removed under view.

From my experience with the instrument, I believe that it is of great value as an accessory to x-ray and transillumination methods. In a case of sphenoiditis

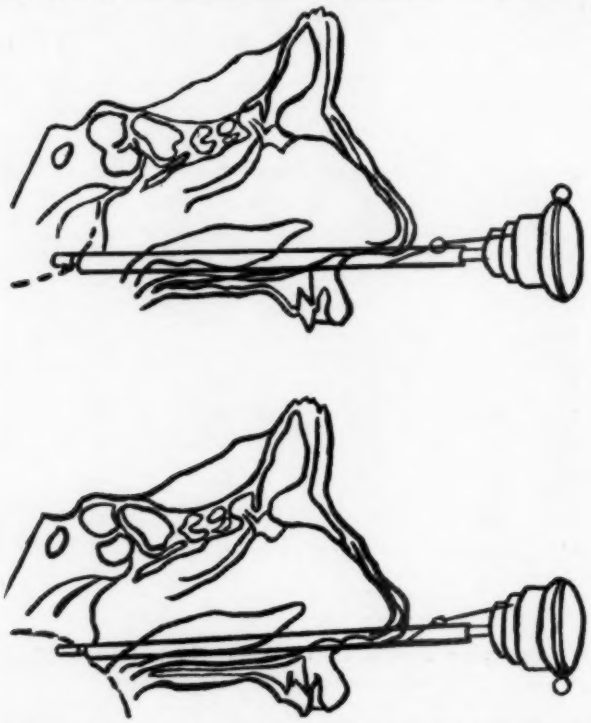


Fig. 6.—Diagram of the sinuscope extending along the nasal floor into the sphenoid sinus.

the condition was diagnosed by visualizing the discharge from the sphenoidal openings; this was corroborated by the x-ray picture.

When any operating on the sphenoid or antrum is being considered, I advise thorough x-ray examination to enable one to recognize the particular anatomic structure in the case in question. It is important to know the depth of these cavities.

As an aid to mapping out the extent of the sinuses, one can inject any one of the opaque x-ray fluids with a small uretheral catheter through the sinuscope.

As an aid to further convenience in the use of the sinuscope, I have arranged to have the caliber of the visualizing tube reduced by 0.25 mm., which I have been informed is possible. This will aid considerably in inserting the instrument in some of the small nasal passages that are seen occasionally.

740 West End Avenue.

MODIFICATION OF THE LICHTWITZ ANTRUM TROCAR*

GEORGE D. WOLF, M.D., NEW YORK

After having tried nearly all known varieties of antrum puncture trocars, I came to the conclusion that the Lichtwitz needle best answers the purpose, because the use of a straight needle is correct when one bears in mind the anatomic region to be invaded.

The maxillary process of the inferior turbinate forms the thinnest osseous portion of the lateral wall.

The pars membranacea is the thinnest portion of the nasal wall of the antrum. It consists of only two layers of mucous membrane, antral and nasal. Its anatomic boundaries are: above, the lamellae of the bulla; below, the superior margin of the inferior turbinate; in front, the anterior attachment of the processus uncinatus and behind, the ramus of the palate bone.

Judging from the ease with which the puncture of the antrum is made when the needle is directed close to the attachment of the inferior turbinate, one may assume that either the pars membranacea extends slightly into the inferior meatus, or else the bony layer of the maxillary process is so thin that it offers hardly any resistance.

Modification of Lichtwitz antrum trocar.

From a practical point of view, it is well known that this region is the most desirable for puncture of the lateral wall of the nasal cavity.

As the space between the inferior turbinate and the antral wall is rather narrow in the majority of cases, the straight trocar has all the advantages over the curved one.

A needle of thin diameter can accomplish the same purpose as that of a heavier one and has the advantage of inflicting less trauma and hence less bleeding and pain. It saves the patient the shock of cracking bone.

The Lichtwitz needle fulfils all the foregoing requirements except that the part one grasps does not fit the thumb and the horizontal bars are straight. This makes it rather cumbersome to handle, and repeated use makes the operator's thumb sore.

These shortcomings have been overcome by placing a shallow, concave metal cup at the distal end of the needle, and curving the horizontal bars to fit the shape of the fingers, as shown in the illustration. The modification allows a firm and steady grasp by the index finger and the application of firm pressure by the thumb.

The needle is 80 mm. long, with a 15 gage.

This instrument is manufactured by E. B. Meyrowitz Surgical Instruments Co., 520 Fifth Ave., New York.

---

*From the Oto-Laryngological Departments of the Sydenham and Bronx Hospitals.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

PERORAL ENDOSCOPY *

LOUIS H. CLERF, M.D.
PHILADELPHIA

It has become apparent during the last few years that the recognition of the importance of bronchoscopy for diagnosis and treatment in disease has resulted in an enormous increase in the proportion of this class of cases as compared with those in which a foreign body is involved, notwithstanding the fact that the actual number of the latter type of cases in which bronchoscopy was used has increased enormously also. After commenting on this fact, Chevalier Jackson,[1] in one of the most important articles of the year, presented an interesting analysis of the reasons for the phenomenal success of bronchoscopy in disease. First among these he placed the restoration of the defensive power of the lungs. He stated that "bronchoscopic researches have demonstrated that the deeper bronchi are practically sterile, and that the bacteria are increasingly numerous as the larynx is approached. As bacteria-laden atmospheric air necessarily reaches the alveoli, the observations justify the inference that the defensive powers of the lung destroy the bacteria. Two obvious elements in this defensive power are the cough reflex and the ciliary action. The tissues and juices everywhere in the body have defensive powers against bacterial invasion; but the defensive power that bronchoscopic studies have demonstrated is one against bacterial invasion by air-borne infection. Invasions by the hematogenous route do not meet with the same degree of defense. It is by assisting in this defense, by the bronchoscopic attack on the invading host from the rear, that the marvelous results of bronchoscopic aspiration in early suppurative pulmonary disease seem to be obtained."

In dealing with the subject of bronchoscopic aspiration, Chevalier Jackson stated, "It is probable that the drainage of superficial foci of suppuration was done with a flint in the hands of the caveman. It is reasonably certain that this was done by the ancient Peruvian. Hippocrates preached and practiced drainage of pus, and since his time drainage has been fundamental in surgery. Bronchoscopic aspiration is the same in principle; the new thing about it is the discovery that with the bronchoscope, suppurative foci can be drained through the mouth harm-

* Submitted for publication, Feb. 7, 1929.

1. Jackson, Chevalier: Bronchoscopy, Past, Present and Future; Address at the Meeting of the Boston Surgical Society for the Conferring of the Henry Jacob Bigelow Medal, New England J. Med. **199**:759 (Oct. 18) 1928.

lessly and without general anesthesia. There is an abundance of clinical evidence at the Bronchoscopic Clinic justifying my opinion that the fundamental factor in all pulmonary pathology is impaired defensive power of the lung due to impaired drainage and deficient aeration. By bronchoscopic drainage we take the load off the cilia and restore spontaneous drainage. With the restoration of aeration and spontaneous drainage we reestablish the defensive powers of the lung. I may be a visionary, but when I see the results obtained by bronchoscopic aspiration early in suppurative disease, massive atelectasis, et cetera, I cannot but feel that the first resort in the future will be not to opiates and other antibechics, but to bronchoscopic aspiration to restore spontaneous drainage instead of hindering it by the continued administration of drugs that paralyze the cough reflex."

SUPPURATION OF THE LUNG

Treatment.—The bronchoscopist can learn much from the internist regarding the value of bronchoscopic treatment in abscess of the lung. The internist approaches the subject from a broad medical standpoint and his judgment is unbiased. McCrae [2] summed up his views on bronchoscopy in treatment for abscess of the lung by stating that, when rupture has occurred into a bronchus, bronchoscopic drainage is, without question, the treatment to be tried first. In his judgment, the earlier it is begun the better it is for the patient. Emphasis should be placed on this fact, as the value of bronchoscopy in abscess of the lungs gains recognition slowly. In a textbook of medicine published recently, mention was not made of it in treatment for acute abscess; it was mentioned in treatment for chronic abscess, in which its value, although great, is less evident. The details of bronchoscopic drainage and the use of applications are not in his province to discuss. The intervals between drainages must be decided for each patient. In early acute cases, it would seem wise to do it at as short intervals as possible for a time.

That patients with advanced bronchiectasis can be aided by bronchoscopic drainage is abundantly proved. It is to be hoped that something may be done by early recognition and drainage at an early stage to lessen the serious late results. In bronchiectasis, the physician must make an early diagnosis so that the bronchoscopist can have his chance to help. In some cases, probably a few, a local process other than a foreign body which causes obstruction in a bronchus may be responsible. If this condition is recognized early and the patients are treated, some may be saved from the fate of chronic bronchiectasis. In the opportunity to do this, one is dependent on the internist for early recognition of the condition.

---

2. McCrae, T.: Abscess of the Lung, Arch. Otolaryng. **7**:103 (Feb.) 1928.

Fischer [3] believed that one should not wait too long before resorting to bronchoscopy if spontaneous improvement did not take place. The likelihood of a cure rapidly diminishes when three or four months have elapsed. If a child is not doing well three weeks after the onset of symptoms, if he does not look well and his fever continues, bronchoscopy had best be started and performed at weekly intervals. It is possible that an unexpected foreign body may be discovered at bronchoscopy. It also definitely establishes the exact site of the disease process, that is, the lobe or lobes of the lung involved. This knowledge may aid further treatment. Bronchoscopy should be kept up until the secretions have practically ceased and roentgen and clinical evidence indicates healing of the abscess. The length of time that bronchoscopic treatment should be continued is also a question which cannot be decided dogmatically. There are cases which respond to irrigations and eventually heal without operation. Their number is small, but if there is no evidence that the abscess is spreading, and that new foci have not developed, and the patient does not get an intercurrent infection, it is justifiable in some instances to postpone operation.

The best initial form of treatment for post-tonsillectomic abscess of the lung, then, is medical treatment, with or without bronchoscopy; if this fails, continuation of bronchoscopy for a time; if both the foregoing methods are ineffectual, some form of operation is indicated, the individual case often being suited for one type of operation rather than another.

Discussing the question of suppuration of the lung from the standpoint of the surgeon, Meyer [4] pointed out the value of bronchoscopic assistance and diagnosis and stated that the bronchoscopist now localizes still more definitely the seat of the suppuration and determines whether one or more lobes of the lung are involved (from the point of precision, he certainly is the best equipped to do so) and gives the patient regular intrabronchial treatment, if he thinks it would be effective. At the same time, an attempt is made to support the work of the bronchoscopist by reducing or removing the foul odor of the sputum by means of intravenous injections of neoarsphenamine. In support of bronchoscopic aspiration in the treatment of abscess of the lung, Meyer believed that early treatment, perhaps better termed prophylactic treatment, was of the utmost importance in beginning suppuration of the lung due to aspiration. Besides, forced active expectoration in the pronounced knee-elbow posture several times in the course of the day, the so-called posture treatment, this prophylactic treatment consists of bronchoscopy with or

3. Fischer, A. E.: The Pulmonary Sequelae of Tonsillectomy in Children, Am. J. M. Sc. **176**:253 (Aug.) 1928.

4. Meyer, W.: Suppuration of the Lung; Surgical Aspect, Arch. Otolaryng. **7**:107 (Feb.) 1928.

without thorough, painstaking aspiration, often intrabronchial treatment also, at as early a date as possible, whether or not the patient is deathly sick with chills and high fever, continuous cough and foul sputum. Naturally, the sooner the foreign substance is removed, the better it is for the patient. As generally known, in one third of these early cases of abscess of the lung due to aspiration, healing occurs spontaneously. But to say, therefore, that bronchoscopy is not required would, of course, be an unscientific statement. How can one know which of, say, thirty such patients will be the fortunate ten who will not need further treatment? Bronchoscopy, therefore, at the earliest moment possible is clearly indicated in every instance of beginning suppuration of the lung due to aspiration. The trained bronchoscopist is the best friend of these patients, for by means of suction promptly applied he lays the foundation for improvement or cure in many cases. Today a trained bronchoscopist is an absolute necessity on the staff of every hospital. He should be a man of precision and circumspection, with a gentle touch, so as to avoid harming the patient; he should be a man whose judgment and diagnosis command respect. It will probably not be difficult before long to obtain from the present generation of physicians all the specialists of this kind needed for the larger and medium-sized cities of the country. As to the smaller cities, towns and villages, it will perhaps be a good plan to employ a skilled bronchoscopist to cover a certain district. With the present easy means of communication, he will be available on short notice in cases of emergency. Patients who are able to travel may, of course, consult the specialist of their choice. If, in the course of weeks or months, the bronchoscopist finds that the patient is not showing improvement, he will refer him to the surgeon. Bronchoscopy and operative surgery are typical borderline chapters.

In commenting on post-tonsillectomic suppurative disease of the lung, Jackson[1] had this to say: "From the bronchoscopist's point of view these cases can be divided into two groups. (1) Those in which the disease is discovered in its incipiency and is promptly treated. Bronchoscopic aspiration will cure nearly all of these. (2) In this group may be placed all those cases in which valuable time has been lost either in diagnosis or in artificial pneumothorax or other methods of treatment. By this I do not mean to minimize the importance of general medical care. On the contrary, medical management is indispensable; but it is of utmost importance that stagnation be prevented at the incipiency. As elsewhere herein mentioned, there is an abundance of clinical evidence at the Bronchoscopic Clinic to show that nearly all diseases of the lung result from temporarily impaired defensive power of the lung, and that this defensive power is restored when aeration and spontaneous drainage are restored by bronchoscopic aspiration. The clogging of the cilia with thick, tough, gummy pus seems to be a fun-

damental etiologic factor." The pus removed by bronchoscopic aspiration is so thick and tenacious that no cilia could waft it. It will not run down the glass walls of an inverted test tube; hence postural drainage must be regarded as inefficient as against such pus. That coughing cannot expel it is shown by the fact that the bronchoscope has found and removed it after prolonged coughing failed to expel it. Jackson regarded this viscid secretion as the fundamental factor in the impairment of the defensive power of the lung and in the remarkable efficiency of bronchoscopic aspiration. He stated that the reason the tenacious viscosity had not been realized is that in sputum the pus floated in saliva. The cause of the great viscosity of the pus was investigated by Jackson and Kolmer. Many fresh specimens of the bronchoscopically aspirated pus were found to contain an excess of fibrin. This was regarded as indicating an excess of fibrinogen produced by inflammatory processes in the case of inflammatory pulmonary disease, such as pneumonia, bronchitis, bronchiectasis and abscess, and by passive congestion in the cases of postoperative atelectasis. Asthma was considered as belonging in the inflammatory class in some cases and in the congestive class in other cases.

In regard to spirochetosis, Jackson stated: "The presence of spirochetes in the mouth of many individuals rendered it uncertain, in a given case, whether the finding of spirochetes in the sputum was evidence of spirochetosis of the bronchi. The bronchoscope, by enabling the removal of specimens of secretions from the bronchi, uncontaminated by oral secretions, gives the laboratory report absolute positive and negative value. Bronchoscopic aspiration has been found an efficient aid to intravenous medication by arsphenamine combined with local endobronchial applications of arsphenamine diluted with normal salt solution."

In a series of 103 cases of abscess of the lung observed by Kernan,[5] he concluded that bronchoscopy was indicated in sixty-eight. Of this group thirty-one patients were cured, as they were relieved of all symptoms; later, two of these developed some other disease and died. Of the others, fifteen were improved, four are still under treatment, nine were lost sight of and nine died. Kernan agreed with other bronchoscopists that patients with abscess following tonsillectomy responded best to bronchoscopy. Twenty-seven of his patients belonged to this group. Of these, fifteen were cured by bronchoscopy. It was interesting to note that nine of these fifteen went on to an uninterrupted recovery following one or two bronchoscopies. One death was attributed to bronchoscopy. In this case the patient had a convulsive seizure following the bronchoscopy, and died in twenty-four hours. At autopsy an embolus was found in the brain.

---

5. Kernan, J. D.: Abscess of the Lung Relieved by Bronchoscopy: Report of Cases, Arch. Surg. **16**:215 (Jan.) 1928.

Kramer [6] discussed the advantages of bronchoscopic treatment in suppuration of the lung and reported the results of treatment in a series of 105 cases; 27 per cent of the patients were considered cured, 44 per cent were improved, 19 per cent either unimproved or referred to the surgeon for operation, and 10 per cent died. The group included cases of acute and chronic abscess of the lung, bronchiectasis, unresolved pneumonia, foreign bodies in the tracheobronchial tree, and new growth complicated by suppuration of the lung. On the basis of the results obtained, he stated that in any case of suppuration of the lung in which pus coming from a suppurative focus could be found by bronchoscopy, the patient should be treated bronchoscopically and medically. If, after a prolonged course of careful and exact bronchoscopic irrigation, the condition did not materially improve, surgery was indicated.

Tucker [7] discussed the advantages of bronchoscopy in the diagnosis of suppuration of the lung and pointed out that the bronchoscopist can furnish definite data as to the location and extent of the lesion; the presence of a foreign body in the larger bronchi can be excluded; aid can be given the roentgenologist by the introduction of radiopaque substances into the tracheobronchial tree. This can be carried out most accurately when the substances are introduced bronchoscopically on the fluoroscopic table. Tissue can be removed bronchoscopically for biopsy when deemed advisable. In the treatment of suppuration of the lung, bronchoscopy aids by improving drainage through the aspiration of secretion and local treatment; uncontaminated specimens of secretion may be secured for an autogenous vaccine; strictures can be dilated and obstructing granulations removed to improve drainage.

Heatly [8] concurred in the generally accepted view that bronchoscopy is a valuable means of diagnosis in obscure conditions of the chest. He pointed out that bronchoscopy, in order to be a safe procedure, cannot be performed by the occasional bronchoscopist. He found bronchoscopy an important adjunct to other fundamental methods of treatment in selected cases of abscess of the lung as well as in early bronchiectasis, and cited a number of cases in which it was successfully employed.

In a series of fifty-eight cases of abscess of the lung occurring after tonsillectomy, Clerf [9] investigated the age of the patients, the time of

---

6. Kramer, R.: Bronchoscopy in Pulmonary Suppuration, S. Clin. North America **8**:377 (April) 1928.

7. Tucker, G.: Suppuration of the Lung; Bronchoscopic Aspects, Arch. Otolaryng. **7**:123 (Feb.) 1928.

8. Heatly, C. A.: Bronchopulmonary Suppuration from the Bronchoscopic Standpoint, New York State J. Med. **28**:854 (July 15) 1928.

9. Clerf, L. H.: Lung Abscess Following Tonsillectomy; Observations Based on a Series of Fifty-Eight Cases, Atlantic M. J. **31**:911 (Sept.) 1928.

occurrence of the first symptoms and the distribution of the lesions. It is interesting to note that forty of the cases occurred in patients between the ages of 20 and 40, while but fifteen occurred in patients less than 20. In three patients, the operation was performed under local anesthesia. The average time of occurrence of definite symptoms including pain, fever, chills or chilliness, cough with or without expectoration and hemoptysis, was seven and one-fifth days. Pain, suggestive of pleurisy, was the most commonly observed first symptom. In 46 per cent of the cases it was the first symptom noted and was observed within four days after operation. Hemoptysis as a first symptom did not occur in any of the cases. In an analysis of the lobar distribution, fifty-seven cases were found to be monolateral; the right lung being involved in thirty-six cases, while in twenty-one the lesion was in the left lung. The lesion was confined to an upper lobe of the lung in 43 per cent of all cases, while in an additional 9 per cent involvement of the upper lobe was associated with that of either the middle or lower lobe.

The results of bronchoscopic treatment were gratifying. Twenty-eight patients were clinically well, seven were definitely improved while in five patients bronchoscopy was discontinued because of lack of improvement. Eleven patients were referred to the surgeons for external operation and four were still under treatment. Three patients died while under treatment. Clerf concluded that with the increasing number of reported cases of abscess of the lung complicating tonsillectomy, it behooves every laryngologist to study his patients carefully before operation and to employ all possible prophylactic measures. The development of pulmonary symptoms following tonsillectomy should immediately raise the question of impending abscess of the lung. No patient on whom tonsillectomy has been performed should be discharged from observation until three or four weeks have elapsed. In a postoperative complication of the lung, no examination should be considered complete unless a roentgenologic study has been made. Bronchoscopic aspiration, carried out by an experienced bronchoscopist, on the advice of the internist, roentgenologist and surgeon, and in conjunction with such medical treatment as may be recommended by the internist, constitutes one of the most valuable methods of treatment. No patient with an incipient abscess of the lung has had the full benefits afforded by medical and surgical skill if bronchoscopy was not considered as a possible method of treatment in his case.

In a consideration of pulmonary suppuration from the standpoint of the roentgenologist, Manges [10] pointed out that there is such a sim-

10. Manges, W. F.: Lung Abscess Following Tonsillectomy from the Standpoint of the Roentgenologist, Atlantic M. J. **31**:909 (Sept.) 1928; Suppuration of the Lung; Roentgenologic Aspect, Arch. Otolaryng. **7**:113 (Feb.) 1928.

ilarity between the many proved infections caused by aspiration and postoperative abscess of the lung that the roentgen evidence must have some value. Localization of the area of suppuration is an extremely important function of the roentgenologist. If bronchoscopy is to be the method of treatment, then localization in relation to a lobe of the lung or a portion of a lobe or a bronchus is sufficient. This can usually be recognized fairly accurately by means of anteroposterior and lateral views or even by stereoscopic films, but a decision is made with greater certainty if the suspected bronchus is insufflated with a small quantity of a bismuth compound or injected with iodized oil; the location of the abscess with relation to the bronchial tree can be ascertained accurately.

If surgery is to be the method of treatment, then localization must be made with relation to the wall of the chest. The roentgenograms must be taken with the patient in the same position as he will occupy for operation. A conference with the surgeon, therefore, is important. Anteroposterior and lateral views are needed. Frequently the most reliable information is obtained by means of the fluoroscope. When cavities are actually present and are to be drained surgically, it is important to know the number and the exact location of each. For this, an injection of iodized oil is used, after the contents of the cavity have been aspirated through a bronchoscope, if possible. At any rate, the injection of oil should be made by means of a bronchoscope into a given bronchus. Indiscriminate injection of iodized oil in quantity into the tracheobronchial tree is much less desirable than injection through a bronchoscope, for the reason that in quantity the iodized oil goes into the parenchymal portion of the uninvolved lung and may entirely obscure the shadow of the oil in the cavity. Again, Manges has seen the normal lobe beautifully injected, whereas the cavities in the diseased lobe have received none of the oil. The ideal situation is to have the oil only in the branch of the bronchus that is involved in the abscess. When there is no cavity nor drainage through a bronchus, insufflation with a bismuth compound is preferable, for the reason that the bronchial branches were clearly outlined without the presence of overlying collections of the dense material. The bismuth compound stops abruptly in the obstructed bronchus, but goes into the third, fourth or even fifth division of the normal bronchi.

One of the chief functions of the roentgenologist is to follow and demonstrate the progress of the disease or the results of treatment. From his experience with a great many abscesses following tonsillectomy, Manges felt that the most important consideration of all was that early diagnosis is almost essential to satisfactory cure. The treatment of the patient in an early case is almost uniformly satisfactory, whereas patients with delayed diagnoses require radical treatment for a prolonged period,

and, in the end, remain invalids more or less. Certainly, bronchoscopy has added a brilliant chapter to treatment in this disease. It has not entirely replaced other surgical methods, but does offer a great deal to those patients for whom the operating surgeon could do but little. When resorted to early in the course of the disease, it brings about a cure in a high percentage of cases without recourse to surgical drainage.

CLINICAL OBSERVATIONS AND EXPERIMENTAL DATA BEARING ON THE ETIOLOGY OF PULMONARY ABSCESS

Increasing interest in the study of the mode of occurrence of abscess of the lung complicating operative procedures has led to extensive experimental investigation and the collection of a large mass of clinical data.

The studies of Fetterolf and Fox, Chandler, Holman, Weidlein and Schleuter support the embolic theory, in that, when infected emboli were introduced into the venous circulation of the neck, pulmonary infection was produced in a considerable number of experimental animals. The observations of Myerson and Daily, and Daily, who found blood in the tracheobronchial tree of patients tonsillectomized under general anesthesia, were corroborated by Iglauer [11] and Vail. Iglauer observed the larynx and trachea of adult patients after tonsillectomy under local anesthesia. The anesthesia was produced by injecting a 1 per cent solution of procaine hydrochloride with epinephrine hydrochloride into the faucial pillars and paratonsillar tissues in the usual manner. In no case was cocaine applied locally. About one half of the patients were given a preliminary hypodermic injection of one-sixth grain (0.01 Gm.) of morphine with atropine. All patients were operated on in the upright position. Iglauer found that the larynx and upper trachea could be readily inspected in practically every case and attributed this to the anesthesia of the fauces by infiltration. Among the fifty patients observed, blood was found in the larynx, the upper trachea or both in nineteen (38 per cent). He believed that post-tonsillectomic abscess may be explained by the occasional prolonged retention in the bronchi of aspirated blood, the contents of crypts, tonsil tissue and buccal secretions.

Vail's [12] studies were carried out on children, aged from 3 to 14 years. Of the 100 patients examined bronchoscopically immediately

---

11. Iglauer, S.: Aspiration of Blood into the Larynx and Trachea During Tonsillectomy Under Local Anesthesia: A Contribution to the Etiology of Lung Abscess, Ann. Otol. Rhin. & Laryng. **37**:231 (March) 1928.

12. Vail, H. H.: The Tracheobronchial Tree in Children with Reference to Blood Aspirated During Tonsillectomy and Adenoidectomy Under Ether Anesthesia, Arch. Otolaryng. **8**:26 (July) 1928.

after operation, blood was found in the trachea and bronchi in varying amounts in sixty-two. No blood was found in a majority of cases in which the laryngeal reflex was present, although one patient had a considerable quantity of blood in the tracheobronchial tree. Two patients vomited during the operation, and neither of these showed any blood in the trachea or bronchi. Although Vail's figures were slightly lower than those of other observers, he believed that they were sufficiently high to make one think of the importance of overcoming the aspiration of blood into the tracheobronchial tree during tonsillectomy and adenoidectomy under general anesthesia.

In an attempt to prove that abscess of the lung was produced by infectious material introduced through the air passages, Allen [13] injected pus obtained from cases of chronic nontuberculous abscess of the lung into the trachea of rats. In none of the rodents was there found a pulmonary abscess or pneumonia. Believing that chilling of the pus might have killed the bacteria, he injected warm pus into the air passages of eighteen dogs and three rabbits. Three of the dogs developed multiple microscopic abscesses. It was noted that these resembled the early abscesses in man and also that they developed in the portions of the lung that were farthest from the main bronchi. Masses of infected tonsillar tissue were then blown, by means of compressed air, into the bronchi of seven dogs. At necropsy it was found that all of the plugs had been expelled and that no infection of the lung had developed. Two dogs developed multiple abscesses following ligation of the main bronchus after purulent material had been introduced, while a third dog developed pneumonia. Four control dogs in which the bronchus was ligated without introduction of infected material developed no complications. Allen concluded that multiple abscess of the lung may be produced in dogs by the injection of warm pus from patients with a chronic abscess of the lung. Obstruction of the bronchus played a dominant rôle in the formation of experimental aspiratory abscess of the lung.

In their studies of experimentally produced abscess of the lung in dogs, Crowe and Scarff [14] introduced the infectious material through the bronchoscope. Pieces of cotton soaked with virulent cultures of *Pneumococcus, Staphylococcus,* varieties of *Streptococcus,* the colon bacillus and various types of fungi were introduced bronchoscopically into the bronchi of dogs. The results either were negative or resulted in a diffuse infection of the lung. Definitely localized, chronic suppuration of the lung was produced, however, when scrapings from pyorrhea cavities

13. Allen, D. S.: The Etiology of Abscess of the Lung; Experimental and Clinical Studies, Arch. Surg. **16**:179 (Jan.) 1928.

14. Crowe, S. J., and Scarff, J. E.: Experimental Abscess of the Lung in the Dog, Arch. Surg. **16**:176 (Jan.) 1928.

were used as the infecting agent. No data could be furnished to indicate whether the spirochetes from the mouth were secondary invaders or whether they were the cause of postoperative abscess of the lung.

Hedblom and others [15] were able to demonstrate pulmonary abscesses in twenty animals in a series of sixty-seven intrabronchial injections. They believed that aspiratory abscess could be produced in the dog if the cough reflex could be controlled sufficiently long to allow the infected material to settle in the alveoli. The highest percentage of abscesses occurred in dogs which received fresh blood mixed with a sputum that contained a large number of fusospirochetes mixed with pyogenes. Pyogenic organisms mixed with blood failed to produce abscesses in any of the animals. A case was cited which indicated that the view generally held that pulmonary abscesses of aspiratory origin were connected with a bronchus while those of embolic origin were walled off and had no bronchial communication could not be accepted as a fact. One of the dogs died seven days after the intrabronchial injection of sputum mixed with blood. At autopsy, an abscess the size of a hen's egg was found in the lower lobe of the lung. On careful examination, no communication of the abscess with a bronchus could be found.

In a large number of experiments, Joannides [16] implanted various foreign bodies into the lungs of dogs by external operation to determine the reaction of the pulmonary tissues. In fourteen experiments, the foreign body was surrounded by a thick-walled cyst; in no case was there produced a characteristic abscess of the lung. The intrabronchial injection of infected blood and tonsillar tissue, scrapings from the teeth of patients with pyorrhea alveolaris and bits of teeth was performed in a large series of dogs with the result that abscess of the lung was produced in a considerable number. Joannides believed that the important factors in the production of abscess of the lung are the abolition of the pharyngeal and cough reflexes and the presence, in the mouth, of mucus or blood with certain characteristic micro-organisms, notably, fusospirochetae. The dimensions and the physical state of the material are important since small masses will reach further in the bronchial tree than large foreign bodies, and thick, tenacious fluid of low specific gravity is less likely to remain in the lung than thinner, less tenacious heavier fluid. The action of the cilia, which, by their rhythmic movement, sweep out the bronchi and trachea, the specific immunity of the lung against certain organisms and the presence of chronic infection of the nose, mouth and paranasal sinuses are also definite factors.

---

15. Hedblom, C. A.; Joannides, M., and Rosenthal, S.: Pulmonary Abscess: An Experimental Study, Ann. Surg. **88**:823 (Nov.) 1928.

16. Joannides, M.: The Etiology of Pulmonary Abscess, Surg. Gynec. Obst. **47**:449 (Oct.) 1928.

BRONCHOSCOPY IN DIAGNOSIS

Carcinoma of Bronchus.—It is now generally acknowledged that carcinoma of the bronchus is more frequently observed than formerly. Whether this represents an actual increase or whether it is a relative increase due to more accurate diagnostic methods cannot be definitely determined.

In Schall's [17] report, a diagnosis of bronchial carcinoma was positively made by bronchoscopy and biopsy in five cases. He concluded that primary carcinoma of the bronchus is not an extremely uncommon disease. Bronchoscopy offered the best means of establishing an early diagnosis of a malignant condition of the bronchi. Patients with obscure conditions of the chest should have the benefit of close cooperation of the thoracic surgeon, internist, roentgenologist and bronchoscopist, acting as a group.

Vinson [18] and others reported seventy-seven cases of primary cancer of the lungs. In twenty-nine of these, a positive diagnosis was made during life by the examination of tissue removed from the bronchus. These observations confirmed the statement, now generally accepted, that bronchoscopy is the safest and most exact method of making an early diagnosis.

In discussing the reports of a number of unusual experiences in the study of intrathoracic diseases, including malignant conditions of the lungs, Kessel and Hyman [19] believed that bronchoscopy was not employed sufficiently often. They regarded it as a necessary procedure in obscure pulmonary conditions. They pointed out, however, that neither the roentgenologist nor the bronchoscopist should attempt to interpret his observations without the aid of the internist, for it is to the latter that they must look for the background and the record of the clinical observations, neither of which can be seen on a film or observed through a bronchoscope.

Bronchial Stenosis.—In cases of bronchial stenosis, the clinical data are seldom sufficient and adequate to determine the etiology and type of stenosis. Huguenin and Soulas [20] stated that only by bronchoscopy, with the bronchoscopic instillation of iodized oil when necessary, can the diagnosis of stenosis be made. Although other methods of introduc-

17. Schall, L. A.: Primary Carcinoma of the Bronchi, Ann. Otol. Rhin & Laryng. **37**:762 (Sept.) 1928.

18. Vinson, P. P.; Moersch, H. J., and Kirklin, B. R.: Value of Bronchoscopy in Diagnosis of Malignant Conditions of the Lungs, J. A. M. A. **91**:1439 (Nov. 10) 1928.

19. Kessel, L., and Hyman, H. T.: Some Unusual and Atypical Intrathoracic Conditions, A. J. M. Sc. **175**:511 (April) 1928.

20. Huguenin, R., and Soulas, A.: The Diagnosis of Bronchial Stenosis, Presse méd. **36**:614 (May 16) 1928.

tion of iodized oil may be utilized in bronchiectasis, the bronchoscopic method of instillation is unquestionably the most accurate in cases of stenosis since it is necessary to guide and control the flow of the oil.

Actinomycosis of Lung.—A rare and unusual case of actinomycosis of the lung in a child, aged 3 years, was reported by Johnson and Kernan.[21] Although the patient did not recover, they believed that benefit resulted from the bronchoscopic injection of iodized oil, 40 per cent. This method of treatment should be supplemented by the peroral administration of large doses of potassium iodide.

Tuberculosis of the Trachea.—Vinson and Habein [22] pointed out the value of diagnostic bronchoscopy in patients with dyspnea of unknown origin. A woman, aged 48, had previously been examined, and a diagnosis of pulmonary tuberculosis made. She again reported for examination about one year later because of dyspnea of six months' duration. The pulmonary lesion appeared to be quiescent and the larynx was normal. At bronchoscopy, a large mass was found in the trachea which reduced its lumen to about one-fourth its normal size. The gross appearances suggested a malignant condition of the trachea except that the extent of involvement was greater than had previously been noted in tracheal cancer. A specimen removed for biopsy disclosed a tuberculous lesion.

Fibrolipoma of Bronchus.—Myerson [23] reviewed the literature of benign pulmonary neoplasms and cited the case of a patient with pulmonary symptoms who was treated for tuberculosis, asthma, chronic pulmonary fibrosis and myocarditis, whereas the basis of his condition was a fibrolipoma in the left main bronchus. Complete removal of the tumor was effected by bronchoscopy. This case furnished additional evidence in support of the bronchoscopic investigation of obscure and atypical pulmonary conditions.

MASSIVE ATELECTASIS OF THE LUNG

Postoperative Pulmonary Atelectasis.—With the advent of bronchoscopy as a means of diagnosis and treatment in cases of pulmonary atelectasis following operation, an entirely different conception of the etiology of this condition was gained. In a study of the records of thirty-three cases of postoperative atelectasis, Lee and others [24] were

---

21. Johnson, F. E., and Kernan, J. D.: Actinomycosis of the Lung, Am. J. Dis. Child. **36**:508 (Sept.) 1928.

22. Vinson, P. P., and Habein, H. C.: Tuberculosis of the Trachea, Surg. Gynec. Obst. **46**:562 (April) 1928.

23. Myerson, M. C.: Benign Neoplasm of the Bronchus; Report of a Case of Fibrolipoma of the Left Main Bronchus Removed Through the Bronchoscope, Am. J. M. Sc. **176**:720 (Nov.) 1928.

24. Lee, W. E.; Tucker, G., and Clerf, L. H.: Post-Operative Pulmonary Atelectasis, Ann. Surg. **88**:6 (July) 1928.

convinced that three factors have been constant in this group; namely, thick, viscid bronchial secretion, some inhibition of coughing and interference with respiratory movements. Because of the inability of the patient to clear the bronchi of the thick tenacious secretion, it accumulates in the more dependent portions of the bronchial tree until at some point the bronchial lumen is completely occluded. The extent of the atelectatic process depends on the site of the bronchial occlusion; as a result there may occur lobular, lobar or massive atelectasis. It has been demonstrated clinically that by making the patient cough, by changing his position (Santee) or by vigorous shaking, an airway can be established past the point of obstruction and the patient may clear the bronchial tree of large masses of secretion. In a number of instances this was ineffective. In eight cases, it was necessary to resort to bronchoscopic aspiration. In each case there was immediate aeration and reinflation of the pulmonary tissue distal to the point of obstruction.

A study, by clinical and roentgenographic methods, of pulmonary atelectasis following operation and its prompt disappearance following reestablishment of the airway by bronchoscopic aspiration of some of the thick secretion suggested to Lee and others [25] that this phenomenon could be produced in dogs following the intrabronchial introduction of material removed from a patient with this condition. In order that all the suspected etiologic factors might be provided, the studies were carried out systematically. The dog was first narcotized with morphine, anesthetized with ether, and an operative incision made through the upper half of the right rectus muscle, entering the abdominal cavity. The wound was closed by layer sutures and strapped with broad adhesive plaster which encircled the lower portion of the costal arches, as is often done in wounds of the upper part of the abdomen. Sodium iso-amyl-ethyl barbituric acid was then injected intraperitoneally, producing profound anesthesia, with abolition of the cough reflex for from five to seven hours. The dog was then laid on its right side, and from 6 to 7 cc. of secretion, previously removed from a patient with pulmonary atelectasis, was introduced through a bronchoscope into the main bronchus of the right lung. A few minutes after the introduction of the mucus, there was definite respiratory distress; later, the movements of the right side of the chest became restricted and there was displacement of the heart to the affected side, presenting the classic picture of atelectasis. This was corroborated by roentgen study. Using acacia, a synthetic material was made, similar in its viscosity to the secretion removed from patients. This was injected bronchoscopically into the bronchus

25. Lee, W. E.; Ravdin, I. S.; Tucker, G., and Pendergrass, E. P.: Studies on Experimental Pulmonary Atelectasis: The Production of Atelectasis, Ann. Surg. 88:15 (July) 1928.

of a dog under the conditions previously reported. Atelectasis promptly occurred. The authors believed that pulmonary atelectasis can be produced at will, provided the cough reflex is controlled and the bronchus is occluded by a material of proper viscosity.

In their studies of the problems of atelectasis, Caryllos and Birnbaum [26] agreed that there is but one cause for the production of collapse of the lungs, and that is the more or less temporary, but complete, occlusion of a bronchus by a plug of mucus, acting as a foreign body, and interrupting completely the penetration of air into the portion of lung depending on the occluded bronchus. In their opinion, complete obstruction is an indispensable factor in the production of this syndrome; the other causes concerned in the etiology acted only as predisposing factors. Interesting studies were carried out on a large number of dogs in which obstruction of a bronchus was produced with the aid of an elastic balloon which was introduced bronchoscopically and then inflated. The evolution of the collapse of the lung was observed by fluoroscopy and by serial roentgenograms. Autopsies were performed and sections were made on all animals. In a certain number of cases, the transparent thoracic window was used without great success. This led to the construction of a vacuum box. With the aid of this apparatus it was possible to observe, step by step, the production of atelectasis of the lung following the bronchoscopic introduction of the balloon into the bronchus. Clinical, roentgen and autoptical studies were then carried out on a series of dogs following the placement of the balloon in a main or secondary bronchus. Caryllos and Birnbaum concluded that the determining cause of massive or patchy atelectasis of the lung, whether it is postoperative, spontaneous or secondary to obstruction by a foreign body or to infection producing bronchial exudation, is always a complete obstruction of a main, secondary or small bronchus. The obstruction of a bronchus in postoperative cases is due to a plugging by mucus, which may be present at autopsy or may have been expelled before death. They believed that plugging of a bronchus may be effected by a thin secretion or exudation occluding the bronchial lumen, so that the word "plug" must not be accepted too literally. In the event that simple methods, such as shaking the patient or changing his position, are not quickly successful, the obstructing substance must be removed bronchoscopically by aspiration or extraction in order to hasten recovery and to avoid further septic complications.

The prophetic utterances of Chevalier Jackson and Willy Meyer concerning the use of the bronchoscope in the investigation and treatment of lobar pneumonia were fulfilled, in part at least, in a preliminary

---

26. Caryllos, P. N., and Birnbaum, G. L.: Obstructive Massive Atelectasis of the Lung, Arch. Surg. **16**:501 (Feb.) 1928.

report of Coryllos and Birnbaum,[27] who came to the conclusion that lobar pneumonia must be considered as a pneumococcic massive atelectasis of the lung, and bronchopneumonia as a lobular atelectasis. In their studies they found a strikingly great number of points in common between lobar pneumonia and massive atelectasis. The more important were: the lobar distribution, the rapid onset of symptoms, the almost identical clinical symptoms except for the more toxic element in pneumonia, the rapid improvement after the release of the bronchial obstruction in atelectasis and after the crisis in pneumonia, the more usual localization in the lower lobes of the lung, particularly the right, the roentgen observations and the gross pathologic and histologic data.

Their experimental work was carried out on dogs. Broth cultures of *Pneumococcus,* type 1, were introduced bronchoscopically into the bronchi of dogs and careful studies carried out. They stated that the sequence of pneumonia is as follows: In the course of a pneumococcic infection of the bronchial tree, occlusion of a lobar bronchus occurs, and this starts the syndrome called lobar pneumonia. The obstruction is effected by the viscid, fibrinous bronchial exudate, aided perhaps by edema of the mucosa and possible damage to the ciliated epithelium. They always found a brownish, viscid substance in the diseased bronchi of the animals which died of "lobar pneumonia." The lung was bluish brown and airless; section showed gradations from atelectasis to "red hepatization," as the latter appears in dogs.

Later, bronchoscopy, performed on a patient with lobar pneumonia, revealed occlusion of the first posterior branch of the bronchus of the left lower lobe of the lung by thick, tenacious, rust-colored exudate. About one teaspoonful of this material was aspirated. The remaining portion of the bronchus of the lower lobe was normal in appearance. The patient made an uneventful recovery, the crisis starting in less than four days after the onset of the disease and forty-three hours after bronchoscopy. Coryllos and Birnbaum stated that if they were correct in their interpretation of the experimental and clinical facts presented, bronchoscopic aspiration in pneumonia, at least in the earliest stages of this disease, would be indicated and that this procedure should merit the consideration of the clinician.

FOREIGN BODIES IN THE AIR AND FOOD PASSAGES

Although the records of the larger clinics show that considerably more than 90 per cent of the peroral endoscopic procedures are performed for conditions other than removal of foreign bodies, there is an actual increase in the number of foreign bodies in the air and food pas-

27. Coryllos, P. N., and Birnbaum, G. L.: Lobar Pneumonia Considered as a Pneumonic Massive Atelectasis of the Lung, Bull. New York Acad. Med. **4**:384, 1928.

sages. This increase of cases of foreign body is unquestionably the result of more careful examinations by the physician and the roentgenologist. It is also the result of the more frequent consideration of foreign body as one of the diagnostic possibilities when taking a history of the patient's illness as well as when making the examinations.

In a report based on a study of thirty cases of foreign bodies in the air and food passages in which treatment was given at the Peking Union Medical College Hospital during a period of eight years, Liu [28] commented on the infrequency of cases of foreign body among the Chinese. He pointed out that pins of all forms, buttons, tacks and many varieties of small toys, so commonly found as foreign bodies in occidental countries, are rarely used in China, whereas peanuts and watermelon seeds are used extensively. Among the thirty cases reported, there were two cases of peanut, two of watermelon seed and one of lotus seed in the air passages. Cases of dental plates in the esophagus numbered five, and there were nine cases of coins or metal disks.

Liu's observations confirmed the now generally accepted views concerning the necessity of education of the medical profession to consider the presence of a foreign body as a diagnostic possibility in all obscure conditions of the lung.

Flandrin and others [29] reported the case of a man, aged 48, in whom a diagnosis of bronchopneumonia was made. Later it was believed that an empyema had developed; tapping was performed on the chest, with negative results. A second tapping yielded several drops of pus. Later a roentgen examination of the chest was made which revealed the presence of a screw in the bronchus of the right lower lobe of the lung. Bronchoscopic removal was successfully performed and the patient promptly recovered. The authors stressed the commonly accepted views that in cases in which a foreign body is present the initial choking attack, the symptomless interval and the development of pulmonary symptoms and signs, simulating pulmonary tuberculosis, lung abscess, bronchiectasis and empyema, call for a roentgen examination of the chest to establish a diagnosis.

In the case of a boy who had aspirated the whistle of a small trumpet, Patterson [30] observed that, during the presence of the foreign body in the bronchus, a distinct whistling noise could be heard on respiration, at some distance from the patient. The sound promptly disappeared after

---

28. Liu, J. H.: Foreign Bodies in the Air and Food Passages Among the Chinese, China M. J. **42**:1 (Jan.) 1928.

29. Flandrin, Ramadier, Soulas and Weill: Report of a Case of an Unsuspected Foreign Body in the Right Bronchus of an Adult, Bull. et mém. Soc. méd. d. hôp de Paris **44**:980 (June) 1928.

30. Patterson, N.: Foreign Body in Bronchus, Proc. Roy. Soc. Med. **21**:1026 (April) 1928.

the bronchoscopic removal of the foreign body. Patterson made this same observation in two other patients in whom similar foreign bodies were present.

In a report of the successful removal, by esophagoscopy, of a large, badly bent curtain pin from the esophagus, Whillis [31] called attention to the oft repeated admonitions against the use of probangs and other blind methods of removal in any of these cases.

In reporting a series of forty-five cases of foreign bodies in the air and food passages, Kully [32] called attention to a situation which was frequently encountered in his cases and which, incidentally, can be corroborated by every bronchoscopist; that is, that the family of the patient suspected of having choked on a foreign body is advised to watch the stools, when often the foreign body either is impacted in the esophagus or is in the air passages. He stated that if every foreign body taken into the mouth was accounted for by careful examination, many of the cases of long sojourn of a foreign body would never occur.

Additional evidence supporting the generally accepted views that waiting for spontaneous expulsion of a foreign body is dangerous was furnished by Peeler [33] who reported that this occurred but twice in a series of 152 cases of foreign bodies in the air passages. He also emphasized the fact that the general practitioner is the first one called on to examine patients with cases of this type and that he should be familiar with the signs and symptoms.

Difficulties in the diagnosis of cases of nonopaque foreign bodies have been experienced by all bronchoscopists and their co-workers. McGinnis [34] cited several illustrative cases of nonopaque foreign bodies in the air passages and stated that the experience of the physician is a great determining factor. Foreign bodies in the trachea, especially present unusual diagnostic difficulties. Attention to the history of the case, carefully made roentgen studies and physical examination and a proper interpretation of these will usually give considerable information. Often, it would be well to perform a diagnostic bronchoscopy before deciding that the suspected foreign body is not present. In a report of experiences gained in a series of fifty cases, Myers [35] corroborated the aforementioned views.

---

31. Whillis, R.: An Unusual Foreign Body Removed from the Esophagus, J. Laryng. & Otol. **43**:792 (Nov.) 1928.

32. Kully, B. M.: Foreign Bodies in the Esophagus and in the Air Passages, Nebr. M. J. **13**:264 (July) 1928.

33. Peeler, C. N.: Peroral Endoscopy, South. Med. & Surg. **90**:487 (July) 1928.

34. McGinnis, E.: Radiotranslucent Foreign Material in the Laryngo-Tracheo-Bronchial Tree, Ann. Otol. Rhin. & Laryng. **37**:1003 (Sept.) 1928.

35. Myers, E. L.: Endoscopic Experiences, Laryngoscope **38**:1 (Jan.) 1928.

The value of magnetic aid in the removal of foreign bodies from the trachea, bronchus and esophagus was carefully investigated by Chevalier Jackson in an extensive series of experiments carried out many years ago. Jackson,[36] in a recent article, stated that the limitations to the practical utility of magnetism in bronchoscopy are the same today as they were when the original studies were made. In a consideration of the problem of magnetic aid in the peroral removal of foreign bodies, the following points are of importance:

1. The foreign body must be of iron, steel or cobalt, wholly or partly. This rules out the use of magnetism in over 90 per cent of the cases. Only a fraction of the nearly 2,000 foreign bodies in the collection of the Bronchoscopic Clinic at the College of Physicians of Philadelphia are magnetic.

2. The foreign body must be free to be moved.

3. The attraction of the magnet for the foreign body is no greater than the attraction of the foreign body for the magnet; a small foreign body pulls but slightly on the magnet, and vice versa.

4. The clinical efficiency of increasing the size and power of the magnet is limited by the fact that we cannot increase the size of the foreign body. If the foreign body were a cast iron dumbbell, a powerful electromagnet would pull it out through the chest wall, and the patient could be suspended in the air by magnetic power.

For the reasons given, the probabilities of the usefulness of magnetism in the removal of a foreign body from the air or food passages vary inversely as the size of the foreign body. The magnetic force in practical use diminishes even more than directly as the square of the distance. The location of the foreign body must be such that, if a core magnet is to be used, the core can be brought within reasonable distance of the foreign body. Prolongation of the core lessens only to a small degree the loss as the square of the distance, but to a limited extent it may be useful if it permits contact.

Magnetic fixation as an aid in the bronchoscopic removal of a foreign body is a new method of using magnetism in this phase of the work. Its development and successful application was reported by Jackson[37] in the case of a soldier, who was wounded in action in 1918, and was found to have a compound fracture of the lower jaw. The fracture united with slight deformity, and the wound healed satisfactorily. Later, cough and expectoration developed with pain in the left side of

36. Jackson, C.: Magnetic Aid in the Bronchoscopic and Esophagoscopic Removal of Foreign Bodies from the Air and Food Passages, Ann. Otol. Rhin. & Laryng. **37**:435 (June) 1928.

37. Jackson, C.: A Bullet in the Lung; Bronchoscopic Removal with the Aid of Magnetic Fixation, J. A. M. A. **90**:1272 (April 21) 1928.

the chest. The patient became quite ill. A roentgen examination of the chest revealed the shadow of a machine gun bullet in the upper lobe of the left lung. By additional roentgen studies, the bullet was found to be located in a cavity in the upper lobe of the left lung. At bronchoscopy it was found that the bullet was free to move in the cavity "around the corner," and that the forceps tended to displace the object to the extreme upper portion of the cavity. With the aid of the Sweet magnet the bullet was brought to the bottom of the cavity where forceps were applied, under fluoroscopic guidance, and the foreign body was successfully removed. Jackson stated that without magnetic fixation the bullet could not have been grasped by bronchoscopic instruments inserted through the mouth, because of the "round the corner" position of the bullet in the upper lobe of the left lung.

The bullet could not have been withdrawn through the mouth by any form of magnet, because no magnet practicable for such use would have sufficient power to withdraw the bullet through the tightly strictured fibrous passage. Though the bullet was free to move in the cavity of the abscess, a few pounds of tractive effort were necessary to withdraw it through the fistula.

For a bullet to be influenced by magnetism, it is necessary that it be composed, in part at least, of cobalt, nickel, iron or steel, and that it be of magnetic forms of these metals. Certain alloys of nickel and steel are not magnetic. Fortunately, in the case cited the bullet was highly magnetic.

In the case of a bullet, or any other foreign body of similar size, anywhere in the lungs, except in one of the upper lobes and except for the special purpose herein indicated, a magnet would be a time-wasting, cumberous impediment and its use probably would be unsuccessful. Bronchoscopic removal by direct vision in the regular way leaves nothing to be desired as to promptness, facility, efficiency or safety.

Smyth's [38] experiences in the use of the fluoroscope for the removal of foreign bodies corroborated the observations of many bronchoscopists. He believed that fluoroscopy should be regarded as a first aid and not as a last resort in the removal of opaque foreign bodies from the bronchial tree. It should be at hand in all cases in which the foreign body has been in the lung for a long period, making the chances of seeing it by direct vision or of feeling it, small. It should be used after one attempt at removal by direct vision has failed, provided the attempt has been made by a competent bronchoscopist, and provided everything possible has been done at the first trial. The mortality is not appreciably raised by this method. The anesthetic should be selected according to the conditions to be combated.

---

38. Smyth, D. C.: The Fluoroscopic Removal of Metallic Foreign Bodies in the Bronchi, New England J. Med. **198**:887 (June 14) 1928.

Fluoroscopic removal is preferable to removal of the foreign body by tactile sensation only. Under general anesthesia the excursion of the foreign body can be controlled by having an assistant fix the diaphragm on the side of the intruder. This is of great assistance in the accurate grasping of the intruder. This point, so far as Smyth knew, was new.

Provided no acute condition is present, the duration of bronchoscopy in adults is of secondary importance, the most important thing being the gentleness of the operator, which means lack of any trauma. In other words, the bronchoscopist should not strive primarily for speed, but should rather exercise the greatest patience, and his manipulations should be the most gentle possible. This conclusion is not based on the series of cases reported in this paper alone but rather the result of Smyth's observations in a considerable number of cases of foreign bodies in the air passages, of fairly long duration.

An expert fluoroscopist is necessary and should share equally in any success achieved by the operator.

Iglauer [39] found that the use of barium sulphate by the roentgenologist, in his diagnostic study interfered with the proper visualization, by esophagoscopy, of foreign bodies in the esophagus. Iglauer recently employed iodized oil instead of barium sulphate to determine the presence of nonopaque esophageal foreign bodies. The oil can readily be removed with an aspirator, immediately bringing the foreign body into view. The foregoing method of localization of foreign bodies with the aid of iodized oil was successfully used by Reineke [40] who corroborated the observations made by Iglauer. It was found to be practically harmless to the patient, since but a small quantity of oil sufficed.

In discussing obscure symptoms in children, Imperatori [41] called attention to the generally accepted views, which were often overlooked, that in children a routine examination of the chest should be confirmed by a roentgen study and, to be complete, this should include the occiput and the tuberosities of the ischium. Imperatori mentioned a Jackson postulate that all children and infants with any symptoms whatever should have roentgenograms taken. He reported the case of a child, aged 13 months, who had been ill for over a month and was in a critical condition. The attending physician made a diagnosis of bronchopneu-

---

39. Iglauer, S.: Nonopaque Foreign Bodies in the Esophagus and Esophagotracheal Fistula; Their Demonstration by Ingested Iodized Oil, Arch. Otolaryng. **7**:229 (March) 1928.

40. Reineke, H. G.: Demonstration of Nonopaque Foreign Bodies in the Esophagus, Arch. Otolaryng. **8**:718 (Dec.) 1928.

41. Imperatori, C. J.: Pericardial Esophageal Fistula Following Foreign Body in the Esophagus; Pneumo-pericardium; Autopsy Report, Laryngoscope **38**:268 (April) 1928.

monia and believed the patient would die. A roentgen examination revealed a large, widely open safety pin at the cardiac end of the esophagus, bronchopneumonia and pneumopericardium. The point of the pin had perforated the esophagus. At esophagoscopy the pin was removed in less than five minutes. The child seemed definitely better for a time; however, the bronchopneumonia increased. A roentgenogram made shortly afterward showed no pneumopericardium. The patient died of pneumonia seven days after operation.

Autopsy disclosed a pericardio-esophageal fistula, bronchopneumonia with infarction, left-sided hydrothorax and chronic purulent pericarditis.

An early roentgen study in this case would unquestionably have altered the prognosis.

Myerson's [42] observations in a report of thirty-nine cases of foreign bodies in the stomach and intestines confirmed the observations of other esophagoscopists, that it is important that those who come in contact with cases in which foreign bodies have been swallowed should be acquainted with the various phases of the subject. No surgeon would care to operate unnecessarily on the stomach of an infant; yet many infants' stomachs are opened at the desire of the family and sometimes of the physician, for quick and visible results. It is well known to those who have seen infants operated on, that babies less than 1 year of age do not stand gastrostomy well. It would be better to operate after a more positive indication than the mere presence of a foreign body in the stomach for a short time. Gastrostomy would be indicated when there are signs of perforation or when a large body will not pass the pylorus, provided gastroscopy has been either resorted to or considered inadvisable. All patients who swallowed foreign bodies which are sharp or the passage of which appears to be delayed should be kept under observation until the object has been evacuated or until its absence from the alimentary tract has been demonstrated.

The bacterial flora of the tracheobronchial tree in cases of lodgment of foreign bodies was systematically investigated by Bucher [43] who studied the secretions, which were collected bronchoscopically at the time the foreign body was removed. Various pathogenic bacteria were found in the trachea and bronchi of these patients. Many of these bacteria were capable of producing infection. There was usually more than one kind in the bronchus of a single patient. In the great majority of cases the degree of infection seemed to depend more on the type of foreign body, the degree of obstruction to drainage, the age of the

42. Myerson, M. C.: Foreign Bodies in the Stomach and Intestines, Arch. Otolaryng. **8**:675 (Dec.) 1928.

43. Bucher, C. J.: The Relation Between the Bacterial Flora and Tracheobronchial Foreign Bodies, J. A. M. A. **91**:633 (Sept. 1) 1928.

patient and the length of time the foreign body had been in the bronchus than on the kind of bacteria present.

DISEASES OF THE ESOPHAGUS

Congenital Stenosis of the Esophagus.—Although it is considered as occurring infrequently, one often wonders whether congenital stenosis of the esophagus is not more common; also, whether many cases are unrecognized. In the event that the stenosis is not complete, the patient may survive and may continue to live for many years under a regimen of careful feeding. Heatly [44] reported the case of a child, aged 8 years, who had had difficulty in swallowing since a period several weeks after birth. Although the diet had been carefully watched regurgitation occurred after each meal. The patient was underdeveloped and underweight. Roentgen examination with an opaque mixture revealed almost complete obstruction of the esophagus in its lower third. At esophagoscopy the esophagus seemed completely closed at this point; a careful search, however, revealed a pinpoint lumen. Esophagoscopic dilatation was instituted, and ultimately the patient made a complete recovery.

In a description of congenital malformation of the esophagus, Abel [45] agreed that this condition is not so rare as might be inferred from the literature. He cited the history of a case of congenital atresia of the esophagus produced by a web at a point about 1 inch (2.5 cm.) below the level of the tracheal bifurcation. This web was ruptured with the aid of the tip of the esophagoscope. No untoward results were noted, and the patient made a satisfactory recovery. Abel believed that some cases in which the patient could be cured are probably considered as hopeless, and he advised careful examination by means of prompt esophagoscopy. By this measure cure might be effected, when ordinarily no treatment would be undertaken.

Additional evidence supporting the generally accepted views held by esophagoscopists on the value of investigation of the esophagus by direct methods in all cases of difficulty in swallowing and especially when there is definite roentgen evidence of disease, is furnished by the reports of Starr.[46] He cited the cases of three women, aged 47, 59 and 51, respectively, who presented the symptoms of dysphagia with regurgitation, loss of weight and roentgen evidence of organic stenosis of the esophagus near its lower end. Before concluding that the condition was cancer, he advised esophagoscopy. In one case, a mass was found which

---

44. Heatly, C. A.: Congenital Esophageal Stenosis, Arch. Otolaryng. **8**:66 (July) 1928.

45. Abel, A. L.: Congenital Oesophageal Obstruction, Brit. M. J. **2**:46 (July 14) 1928.

46. Starr, F. N. G.: Hyperkeratosis of the Esophagus, Canad. M. A. J. **18**:22 (Jan.) 1928.

suggested papilloma; in a second case, a nonulcerating mass was found obstructing the esophageal lumen. A specimen of tissue removed at esophagoscopy was diagnosed as hyperkeratosis. In the third case, a mass was found which was suggestive of carcinoma. A biopsy was performed and a diagnosis of hyperkeratosis was made. The patients all were treated esophagoscopically, and bouginage was instituted. Swallowing improved, the normal weight was regained and the patients recovered completely.

Syphilis of the esophagus is rarely recognized in the diagnosis. Abel [47] believed that it is observed once or twice in every thousand cases although it practically always occurs as a secondary manifestation during that stage as part of a general inflammation of all mucous membranes. Usually there is a complete absence of all symptoms referable to the esophagus. It is only when a secondary esophagitis or a stenosis develops that patients are sent to the esophagoscopist for investigation. Abel pointed out that difficulty is encountered in making a purely visual diagnosis. Biopsy often is necessary and in certain cases serologic studies of the spinal fluid and a therapeutic test are indicated. He emphasized the fact that syphilis of the esophagus is not so rare as the literature would indicate and that esophagoscopy is imperative to rule out a malignant condition.

Blastomycosis of the Esophagus.—Esophagoscopic investigation, with the removal of a specimen of tissue for biopsy, by Vinson and others [48] established a diagnosis of blastomycosis of the esophagus in the case of a man who had complained of dysphagia for nine months. There was a history of pulmonary tuberculosis and definite evidence, obtained by clinical and roentgenographic means, showed that the process was active in the upper lobe of the right lung; in addition, tubercle bacilli were found in the sputum. Esophagoscopic examination revealed an annular funnel shaped lesion which was granular and soft; the diameter of the stenosed lumen was about 4 mm.

An unusual case, a pedunculated lipoma of the esophagus, was reported by Garretson and Hardie [49] as occurring in a man, aged 59. It was discovered largely by accident, since it was brought up when the patient vomited while Barany caloric tests were being carried out. Esophagoscopy showed the growth springing from the posterior wall of the esophagus at its upper end. It was removed by means of a tonsil snare, and the operation was practically bloodless. The patient made a

47. Abel, A. L.: Syphilis of the Esophagus, Lancet **2**:441 (Sept. 1) 1928.

48. Vinson, P. P.; Broders, A. C., and Montgomery, H.: Blastomycosis of the Esophagus, Surg. Gynec. Obst. **46**:255 (Feb.) 1928.

49. Garretson, W. T., and Hardie, G. C.: Another Case of Pedunculated Lipoma of the Esophagus, J. A. M. A. **90**:1373 (April 28) 1928.

complete recovery. The growth measured 15 cm. in length, with an average diameter of 15 mm.

Myerson's [50] report on esophageal injury dealt with a break in the continuity of the esophagus due to pointed foreign bodies, instruments or local morbid processes, capable of sudden penetration. Twelve cases were reported. Because of this danger, esophagoscopy should always be performed with utmost care. The upper orifice of the esophagus is a particularly dangerous point. All the reported cases of perforation of the thoracic portion of the esophagus terminated fatally; in two cases of perforation of the cervical esophagus, the infection was walled off spontaneously.

---

50. Myerson, M. C.: Perforations of the Esophagus, Ann. Otol. Rhin. & Laryng. **37**:545 (June) 1928.

Abstracts from Current Literature

Ear

THE REASONS FOR AND RESULTS OF A NEW OPERATION FOR DEAFNESS. J. NORVAL WATT, Laryngoscope **38**:723, 1928.

Obstruction of the eustachian tube is an extremely unsatisfactory condition to treat, owing to its inaccessibility and the difficulty of medication. On the patency of this tube depends the mobility of the ossicular chain, and on it depend the free excursions of the tympanic membrane and the membrane of the fenestra ovalis. A negative pressure in the tympanum causes a sharp retraction of the tympanic membrane, with impaired mobility of the ossicular chain, resulting in tinnitus, deafness and a sensation of fulness in the ear. In severe cases of long standing in which the deafness has become profound and chronic, the associated head noises often become incessant, causing insomnia which may lead to neurasthenia and mental disorder. It is in this type of case that the author has devised an operative procedure for relief. The operation consists in exposure of the mastoid antrum, with enlargement of the aditus and the insertion of a small gold tube into the tympanum, the other end of which extends to the skin margin. The outer end of the tube is equipped with a flange which lies flat on the surface of the skin. The tube is shaped to fit each individual case, being bent over an obturator to avoid kinking. The incision is then tightly closed about the tube. A cap may be worn over the tubal opening as desired. The author reports satisfactory results.

SNAPP, Grand Rapids, Mich.

THE INFLUENCE OF THE TRACTION OF THE MUSCLE ON THE ORIGIN AND GROWTH OF THE MASTOID PROCESS. HO-CHING YANG, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:272 (Nov. 10) 1928.

The author concludes that the postembryonic origin of the mastoid process is simultaneous with the pneumatization of the bone. It seems that the pneumatization forms the incentive to grow. If the pneumatization is lacking, the mastoid process remains smaller than normal. The pull of the sternomastoid muscle stimulates the growth. It is evident, in the author's opinion, that the petrous portion, to which this muscle is attached, grows more than the squamous part. The author claims that the architecture of the completed mastoid process is the consequence of traction of the muscle. The inner architecture of all other bones, in the new-born infant, so far as it is influenced by the traction of the muscles, is completed at birth. In the mastoid process, it is created postembryonically. It is the only bone which is formed after birth. Investigations must be carried on in order to learn whether unilateral traction of the muscle in congenital caput obstipum influences the structure of the mastoid process. Grahe claims that the traction of the muscle has no influence on pneumatization, but that it influences the length of the mastoid process.

PIGMENT ANOMALY OF THE RIGHT AURICLE, THE MUCOUS MEMBRANE OF THE TYMPANIC CAVITY AND PHARYNX (PIGMENTED HEMANGIOMA). T. HUENERMANN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:284 (Nov. 10) 1928.

A man, aged 48, presented himself at the Berlin clinic in June, 1926, because he had difficulty in breathing through his nose. Since early childhood, his right auricle had been blue and soft but fleshy like that of other people. Physicians and charlatans treated the auricle, with the result that scars developed and the form was changed. The meatus and the drum membrane showed a normal color, but the latter was sprinkled with bluish-black spots which were located apparently

on the mucous membrane of the tympanum. The left ear was normal. The whole posterior wall of the pharynx showed the same discoloration as the auricle. The nasal cavity did not show any pigmentation, nor did the rest of the body. Biopsy showed the specimen to be rich in vessels, especially the lamina propria of the mucous membrane. Nevus cells with a large vesicular nucleus were absent, but their absence does not prove anything. Bettmann spoke of a nevus depigmentosus in isolated areas with absence of pigment and hair. Nevi are frequent. Hughes found only five of sixty-five children, aged from 8 months to 1 year, without a nevus. The nevus described by the author was a congenital malformation. The localization is easily explained by the fact that the tympanum and tube develop from the first pharyngeal pouch and that the tube develops by detachment of the tympanic cavity from the pharynx (Alexander).

The pigment consists of melanin. It is not surprising that the nevus in the region of the mucous membrane of the tympanum, the tube and the pharynx is rich in pigment. Becker found pigment, in 74 per cent of the cases, in the normal mucous membrane of the mouth. Mostly, well developed dendritic cells were found by him. Pigmentation of the oral cavity in its posterior parts is found in the horse. It is almost always present in cattle (tongue, hard palate and mucous membrane of the cheek), and is frequently encountered in the dog. Professor Drahm found it also on the soft palate round the isthmus, but never in the pharynx. Also, Jost mentions pigmentation of the oral mucous membrane in some animals as a normal condition. In the case described, an apparently benign telangiectatic angioma, with a rich deposit of pigment (melanin), was present. It was based on a congenital disturbance of development.

HISTOLOGIC INVESTIGATIONS CONCERNING THE BEGINNING OF THE OTOSCLEROTIC DISEASE OF THE BONE. DOEDERLEIN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:293 (Nov. 10) 1928.

The opinions concerning the beginning of otosclerosis differ materially. The author tried to learn whether a progressive or retrogressive process is present in the beginning. He made histologic examinations in six cases and came to the conclusion that the vessel coats of Manasse are a stage of the otosclerotic disease of the bone. They must be taken for the initial stage, because in some cases no otosclerotic foci are present, except the changes in the vessel coats. The view that a retrogressive bone process is the beginning of the disease allows certain conclusions which explain the nature of otosclerosis. The result of the investigations contradicts Manasse's conception of a pronounced inflammatory chronic progressive disease process, and also the views of Otto Meyer and Lange, who think that the disease is a tumor formation. The latter view is improbable, because otosclerotic changes in the bone have so far not been found in children under the age of 4 years, although a large number of petrous bones of children have been examined. This negative observation induces the author to state that the disease is not a hereditary malformation but that it develops postembryonically. Wittmaack claims that the beginning of the disease is a resorption process of the bone in the surrounding of the blood vessels. This view corresponds with the result of the investigations of the author. So far, it cannot be told with certainty whether the causative factors of the bone resorption are of a local nature, as Wittmaack's observations seem to show, or whether they are of a general character, as the clinical experiences seem to prove. It is possible that the same rebuilding process of the bone may be the result of various causative factors, local as well as general. The author inclines to lean to the latter view, because a comparison of the described pathologic changes of the bone in the capsule of the labyrinth with the bone changes in rickets and osteomalacia shows a surprising identity, especially if the specimens are stained with thionin. Therefore, the author repeats the statement made in an earlier publication, that otosclerosis represents a bone process at least similar to that found in rickets and osteomalacia. These latter diseases are undoubtedly based on a general cause; therefore, a general cause must be accepted also for otosclerosis. The differences of the

bone changes correspond with those in rickets and osteomalacia and can be explained by the peculiar nature of the bone of the labyrinthian capsule. This view gains weight because it fits in well with the clinical experiences in otosclerosis. The investigations of the author referred only to the beginning of the disease in the bone. The various authors agree about the subsequent course in which extensive new formations of bone take place.

AMBERG, Detroit.

THE AUROGRAPH OF KUBO. INO KUBO, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:320 (Nov. 10) 1928.

The shape of the auricle is of the greatest interest from the point of view of crime and anthropology. Photographs or free drawings are not reliable. The author constructed an apparatus on the principle of the panograph. When an outline of the ear is drawn by the end of the compass, the parallel pin traces the outlines on the paper. The apparatus consists of: (1) two movable parallelograms; (2) a drawing plate of glass with parts for attachment, and (3) a headband of hard rubber to which the glass plate is attached. The glass plate should be thin. It has a frame but can be taken out of it. It can be moved vertically and horizontally. The paper for the drawing is fixed on one half of the glass plate with clamps. It is best to mark three points of the margin of the auricle for orientation before beginning with the drawing.

ROENTGENOGRAPHIC CONTROL EXPERIMENTS OF THE EFFECTS OF HARTMANN'S BENT TYMPANIC CANNULA IN TYPICAL CHOLESTEATOMA SUPPURATIONS OF THE EAR. BIRKHOLZ, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:326 (Nov. 10) 1928.

Hopmann uses large quantities of alcohol (100 cc.) and Thorman small quantities for epiretrotympanic irrigations. In the clinics in Erlangen, Kiel and Halle, the Hartmann-Bezold boric acid water irrigations are employed. Ruttin devised an attic syringe for forceful syringing and aspiration. The author has used for nine years the original Hartmann-Bezold technic. He abandoned the attic syringe because: 1. It cannot be used as gently as the cannula attached to the tube. 2. The current is stronger. Sometimes, only apparent cures have been noticed. Careful curretting with subsequent syringing helps at times. In these instances, the cholesteatoma is small, fills only the epitympanic cavity and does not reach the antrum. If a small fistula is present, syringing with subsequent instillations of boroglycerine or alcohol with salicylic acid do not yield results. The observations in a subsequent radical mastoid exenteration show that the antrum is enlarged and that the cholesteatoma is extensive. The question arises: How deep does the fluid of the syringe enter? A model of glass, imitating natural conditions, shows the difficulties of washing out a cavity with narrow cannulas.

Examination with contrast fluids allowed the author to learn, in twelve patients, how far a fluid enters the epitympanal cavities. Rather warm iodized sesame oil was used (40 and 20 per cent) through fistulas at least 3 mm. in diameter, with a tube of a lumen 2 mm. The meatus and tympanic cavity were sponged gently. The roentgenogram was made with a soft tube (50 kilovolts) with instantaneous exposure (2 seconds with 20 milliamperes), while the patient was sitting. In a second series, an iodine-lithium preparation, a thinner fluid of the density of water, was used. Birkholz found that the upper spaces could not be filled in any instance with the Hartmann cannula, and concluded that the stream of the bent cannula reaches the upper spaces only in a limited number of cases. They may be filled with iodized oil 40 per cent by partial evacuation of the air with a bag, so that the fluid enters the cells spontaneously. This question, however, is not discussed.

The general use of Hartmann's cannula in cases of cholesteatomatous suppuration with a fistula cannot be considered a rational therapy. It constitutes only a superficial procedure of cleansing in order to prepare for intervention on a larger scale by way of the canal or mastoid process.

THE BACTERIOLOGY AND CLINICAL COURSE OF ACUTE MIDDLE EAR SUPPURATIONS, ACUTE MASTOIDITIS AND THEIR COMPLICATIONS. WALTER HESSE, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:372 (Jan. 7) 1929.

The course of an acute suppuration of the middle ear and acute mastoiditis can be influenced by very different factors. Examinations were made of 276 patients. A separate picture was furnished by the mucosus. It was especially serious for adults. Wirth was the first to show that the mucosus was agglutinated in all instances by the American pneumococcus III. If there is a suspicion that the mucosus is present, one must insist on the agglutination test, in addition to staining of the capsule and the culture on blood agar soil. The agglutination reveals the mucosus comparatively often during the first and second year but without striking malignancy. The gravity of the infection is dependent not only on the virulence of the microbes, but far more on the resistance of the body. The author has stated that determination of the resistance is uncertain. Yet by certain methods of a bacterioserologic nature (Ruge-Philipp's virulence test), as well as by the faculty of resistance of local cells, one can try to establish it to a certain degree. These investigations show the importance of the local forces of defense which play a part only in acute suppurations of the middle ear and mastoiditis without complications. It was suggested that the author influence the focus therapeutically. He used the antivirus of Besredka. The results were not encouraging; perhaps, the unfavorable anatomic conditions of the middle ear were responsible. Good results, however, were achieved by local treatment of otitis externa with staphylococcus vaccine. As a rule, a certain disposition or constitution is necessary for the tympanic cavity to become infected. This also holds for the propagation of the process. It could be observed especially plainly during the epidemic of the grip, when grave complications occurred more frequently, and after measles, scarlet fever, tonsillitis, etc.; it could also be observed in diabetics, in which grave complications were noted. These dispositional and constitutional factors must be taken into consideration when an operation is to be decided on. In the majority of cases, it could not be established that such factors favored the infection, but they might be present. The disposition to a suppuration of the middle ear and its complications may be based on anatomic conditions. The author has considered especially the character of the mucous membrane of the middle ear on which the pneumatization of the mastoid process depends, according to Wittmaack.

Hyperplasia of the mucous membrane facilitates an infection. An extensive destruction is found in a mastoid process with small cells, with an average degree of hyperplasia of the mucous membrane. Perhaps conditions unfavorable for an escape of secretions come into play, owing to the inflammation and swelling of the thick mucous membrane which lines the small cells. Normally pneumatized mastoid processes, the structure of which is based on a normally involuted mucous membrane, were found rarely. Generally an infection of the mucosus was present. The cases in which the mucosus was found showed that age and sex are, to a certain extent, important in an infection.

An infection of the middle ear depends on many factors. Taken singly, the bacteriology, the virulence, the blood picture, etc., or the roentgenogram showing the character of mucous membrane alone cannot determine the cause of the infection. Neither would it allow a prognosis. All these factors must be considered in their totality. Naturally, there are cases in which a single factor comes to the fore. For instance, extremely virulent microbes may cause an infection under otherwise normal physical conditions. The difficulty of judgment by virtue of all these components consists in the fact that nothing sure is known concerning the relation of disposition and constitution to infections, with the exception of the anatomic constitutional factors mentioned before. There remain unknown factors which must be considered and evaluated by the clinical eye and experience. But also the bacteriologic and roentgenologic observations will give assistance.

AMBERG, Detroit.

Pharynx

THE ETIOLOGY AND THE ETIOLOGICAL TREATMENT OF PLAUT VINCENT'S ANGINA. P. MANGABEIRA-ALBERNAZ, Laryngoscope **39**:1, 1929.

The disease commonly called Vincent's angina is a fusospirochetosis and is caused by the association of the fusiform bacillus of Le Dantec with the spirochete of Vincent. The important factor to be kept in mind in considering the etiology is that the lesions are produced by the joint action of the two organisms, neither being able alone to bring about the morbid character of the condition. It has been demonstrated by careful studies in pathologic anatomy that the spirochete penetrates deeply into the tissues, and in order to reach it therapeutically it is evident that the remedy used should fulfil special conditions which the author believes have usually been ignored. The various requisites to be considered in the choice of a remedy include the employment of one that is readily absorbed by the tissue in order to penetrate to the deeper layers. It should be antiseptically active for an appreciable time; it should be neither caustic nor destructive, but, at the same time, it should have a dissolvent action on the necrotic tissue characteristic of the lesion. Its antiseptic action should be specific on one or the other component of the symbiosis, for if one of these is eliminated the symbiosis is destroyed.

These various conditions have been found to be present in a high degree in only two series of substances: the bismuth substances and the arsenobenzenes. The author has carried on extensive work with the bismuth salts in the treatment of Vincent's angina and finds that it has many advantages over the arsenobenzenes, among these being that it is less toxic, more powerful, more economical and immediately and certainly sedative in allaying the characteristic pain. The treatment usually employed consists in the daily local application to the ulcerated area of a salve emulsion of bismuth tartrate of 30 per cent strength. This is supplemented with the gargling of any mild antiseptic every two or three hours. The author finds that the severe cases rarely require more than three treatments.

TUMORS, BENIGN AND MALIGNANT, OF THE TONSIL AND PERITONSILLAR AREA. LOUIS S. DUNN, Laryngoscope **39**:16, 1929.

Tumors of the tonsil and peritonsillar region, whether benign or malignant, possess the same histologic characteristics as do similar growths in other parts of the body. Papillomas are probably the most frequent type of benign tumors encountered in the throat and are usually easy to recognize because of their light pinkish color and, at times, their raspberrylike appearance. They may be sessile or pedunculated. Adenomas, fibromas, chondromas, angiomas, dermoid cysts and osteomas may also occur in this region. The symptoms are generally those due to mechanical interference, and the treatment consists in simple removal, following the technic ordinarly employed in tonsillectomy.

Malignant disease of the tonsil or surrounding tissue is nearly always primary, the varieties encountered being sarcoma, lymphosarcoma, epithelioma, scirrhous carcinoma and adenosarcoma. Sarcoma may be of the round, small or large spindle cell type. It exhibits rapid growth and frequently appears bright red and succulent. Lymphosarcoma is the most common type encountered in young people. It assumes many typical forms, and there is an early tendency toward ulceration. Carcinoma presents a hard, uneven surface, surrounded by an area of induration which ulcerates early, the ulceration spreading both in depth and in breadth. There is early involvement of the cervical glands, and a peculiar cachexia is usually present. The scirrhous variety of carcinoma is slow in growth and ulcerates late in the course of the disease.

In the treatment of neoplasms of the tonsil, the principles underlying the treatment of similar growths elsewhere in the body must be kept in mind. Surgery, radium, the x-rays, diathermy, electrocoagulation and various other procedures have been used with varied results. The author believes that after a definite diagnosis of malignancy has been made, the mass should be exposed to the roentgen

rays by an expert roentgenologist. If the growth can be reduced in size, together with some reduction of the glandular involvement, surgery may then be indicated. If surgical intervention seems indicated, a primary ligation of the external carotid is done and the mass enucleated as cleanly and completely as possible. Following the operation, the patient is again referred to the roentgenologist for a prolonged course of treatment. The author is rather averse to the use of radium because of the uncertainty of its destructive power outside the tumor area.

SNAPP, Grand Rapids, Mich.

VESSEL CHANGES IN THE PERITONSILLAR TISSUE IN CHRONIC TONSILLITIS. H. C. RIECKE, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:261 (Nov. 10) 1928.

The histologic picture of chronic tonsillitis is well known. With the exception of occasional cartilaginous and osseous formations in the peritonsillar tissue, the investigation usually reveals only an increase in the connective tissue, which can be combined with hyalinization of the same, and an obliteration of the vessels. Other changes have not been noted. Laskiewiecz found in chronic tonsillitis an increase of elastic fibers in the connective tissue and an increase of the reticular tissue in the lymph follicles and in the periphery of the same. This is missing in hyperplasia. On the end-vessels, he observed, at unregenerated spots, oval dilatations of the lumen and some sinus-like formations in the lymph vessels. The author reports three cases in which careful histologic examination of the tonsillar and peritonsillar tissue was made. He comes to the conclusion that also in light and uncomplicated cases of angina, thrombophlebitis can occur in the peritonsillar tissue without causing manifest clinical symptoms or general sepsis. Such cases can occur with or without abscesses in the peritonsillar tissue. In one of the cases, peritonsillar abscesses had occurred, and complications in the kidneys and joints had been observed. These could be traced to changes in the blood vessels. The cases described show that a thrombophlebitis may occur which does not always produce threatening symptoms but which can be, if only temporarily, a cryptogenic source of infection which the organism, as a rule, can combat. Unknown factors may come into play. Why should inflammation progress in one case and not in another? The anatomic structure of the peritonsillar tissue appears to be not without significance. Gaps may be caused by protruding crypts or cones of lymphatic cells, which favor the propagation of a primary infection in the tonsil. Generally, however, the peritonsillar tissue is the first barrier, as can be seen by the increase and cicatricial change of the tissue. It must be emphasized that staining of the elastic membrane is especially adapted to, and imperative in, the detection of these changes. Changes of the vessels can thus be shown which otherwise cannot be found.

In one case, the staining of the elastic membrane showed that at a certain spot of the vein the intima was thickened by connective tissue mixed with fine elastic fibers, whereby the lumen of the vessel was narrowed by one-third. In all three cases, there had not been surgical intervention previously, so that the thrombi could not be attributed to incisions. Artefacts are repeatedly caused in small arteries by snaring off of the tonsil at the lower pole. The intima is injured, naturally. On account of the elasticity, the ends of the intima snap back and roll around themselves, whereby a part of the internal elastic membrane splinters off. These pictures are found only near the places of detachment. This may be the reason why bleeding from arteries is observed relatively rarely. The lumen of the arteries is generally closed by this method of occlusion of the stumps.

AMBERG, Detroit.

Nose

LATENT DISEASE OF THE MAXILLARY SINUS. WILLIAM MITHOEFER, Laryngoscope **39**:29, 1928.

Pathologic changes in the maxillary sinus have often remained unrecognized because of the lack of symptoms referable to the nose. The normal mucous

membrane lining the antrum becomes, with pathologic changes, an edematous one of low vitality, with a predisposition to recurrent infections, and may even become an atrophic pyogenic membrane after repeated inflammatory attacks. Close observation has disclosed the fact that a toxemia may be caused as readily by a low grade infection without demonstrable pus within a bony cavity as it is by a purulent infection. Consequently, the author believes that in uncovering a hidden focus of infection within an antrum, a definite and important step is made in the practice of preventive medicine.

The diagnosis of these latent sinus infections is frequently difficult and requires extremely careful observation and study. Except for the presence of repeated vasomotor disturbances of the nasal mucosa, few, if any, local changes are found in the nose. The presence of a hyperplastic ethmoiditis, a protrusion of the membranous middle meatal wall of the antrum or a polypoid change of the inferior turbinal, especially in its posterior third, should make one suspicious of the possible presence of an antrum infection. The history of repeated colds and of a persistent postnasal discharge of mucus are also factors to be considered. Latent antrum disease is frequently responsible for many of the aggravating symptoms of hay-fever, as evidenced by the fact that irrigation of the antrum with hypertonic saline solution during the attack will often bring immediate relief. The instillation of iodized oil into the antrum, followed by a skiagram to denote any possible filling defect, is a valuable aid in determining the presence of these latent conditions. The skiagram, without the aid of the iodized oil, is not conclusive, especially in those cases which reveal negative observations but arouse suspicion clinically. The author has repeatedly found marked hyperplasia in deep recesses of the antrum in patients in whom a clear skiagram and negative lavage were obtained. Lavage may often be negative. Especially is this true when there is good drainage because of a large accessory ostium. Close follow-up of all cases of acute antrum infection is extremely important. Even though the pus disappears after several irrigations, a low grade latent infection may linger, which may become a definite focus.

The importance of recognizing these latent and obscure infections before or at the time of doing an intranasal operation is strongly emphasized. If an antrum infection is overlooked at the time of an ethmoid exenteration, the end-results may be discouraging to both the patient and the surgeon. In such instances, it is often impossible to persuade the patient to undergo a second operation. The method of approach in dealing with these latent antrum conditions may be either intranasal or radical, depending on the individual case. Intranasal procedures frequently are all that are required.

SNAPP, Grand Rapids, Mich.

LIGATURE OF THE INTERNAL MAXILLARY ARTERY. A. SEIFFERT, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:323 (Nov. 10) 1929.

Hemorrhages from the internal maxillary artery or its branches not infrequently defy the usual measures of control. Cases of arterial nasal hemorrhage in which local therapy is not successful require ligature of the external carotid. The author does not consider it sufficiently reliable on account of the anastomoses. The internal maxillary artery should be ligated near the bleeding spot, on its path through the infratemporal or sphenopalatine fossa, where also its branches, the posterior alveolar, the descendent palatine, the infra-orbital and the sphenopalatine artery, can be reached. This procedure is comparatively easy for any one who is accustomed to operate with reflected light. The maxillary antrum is opened in the canine fossa just as it is in the Caldwell-Luc operation. The opening must be sufficiently large. A piece of the thin bone at the posterior wall is loosened with a few blows of the chisel, freed with a hook and removed with a forceps. The periosteum is carefully incised and the fat tissue separated bluntly. Now the artery becomes visible or can be felt with the tip of the finger. The artery can be easily pulled forward a little with a blunt hook and isolated. It can be tied with the aid of an aneurism needle or a slender nasal forceps. It is advisable to place the ligature near the entrance of the nose at the sphenopalatine foramen, in order to eliminate as many communications as possible. The nose can remain

packed during the procedure. A wide opening into the lower nasal meatus is recommended in order to allow an escape of the secretion. The theoretical fear that a phlegmon with the formation of thrombi of the venous plexus may occur has not been substantiated, even if a severe suppuration of the maxillary antrum was present. The author has ligated the internal maxillary artery not only in so-called uncontrollable epistaxis, but also in severe secondary hemorrhage after operations, and prophylactically before operations on tumors rich in blood (angiomas, etc.), and in removal of the sphenopalatine ganglion through the maxillary antrum, although he carries out this operation mostly without ligature. This is the method of choice for the author, because it is more simple than the ligature from the outside and it does not leave any scar.

AMBERG, Detroit.

Miscellaneous

DIAGNOSIS OF FOREIGN BODIES IN THE UPPER RESPIRATORY TRACT BY VIRTUE OF CHANGES IN THE LUNGS. E. ALEXANDROWSKAJA, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:306 (Nov. 10) 1928.

The diagnosis of foreign bodies in the upper respiratory tract is based principally on the anamnesis and investigations with the aid of laryngotracheobronchoscopy. Too little attention has been paid, until lately, to changes in the lungs. These very changes disclose, in some cases, a foreign body which otherwise cannot be discovered even by a roentgenogram — except by laryngotracheobronchoscopy. The latter procedure is not entirely without danger. Even trained laryngologists find that pneumonia and not infrequently edema of the larynx follow. Bronchoscopy must be employed only when absolutely necessary. In the otolaryngologic clinic of the Second University in Moscow, forty patients were observed mainly in regard to the changes in the lungs.

1. With foreign bodies in the larynx, the subjective symptoms are hoarseness, stenotic respiration and difficult inspiration. The objective symptoms are sharp, hard breathing with râles in both upper lobes.

2. With foreign bodies in the trachea, the following symptoms are present: periods of coughing, similar to whooping cough, when the patient moves and after sleep in the morning; diminished fremitus pectoralis at the apex of the lung, on the side on which the foreign body lies at the wall of the trachea, and, if the foreign body lies at the bifurcation nearer to one or the other bronchus, a decrease of the fremitus pectoralis at the apex of the corresponding lung and the upper lobe of the lung. The nearer the foreign body is situated to the lumen of the bronchus, the larger is the area in which the fremitus pectoralis and the shortening of the sound can be noticed.

3. With foreign bodies in the bronchi, the following facts are noted: (*a*) When the foreign body lies at the entrance of the bronchial stem, a decrease of the fremitus pectoralis is observed in the whole lung, especially pronounced in the upper lobes, in the neighborhood of which the foreign body is located. Shortening or dulness of the sound, according to the size of the foreign body, is observed in the whole lung, more pronounced in the upper lobes. (*b*) If the foreign body is located in the bronchial stem below the branching off of the upper branch, diminished fremitus pectoralis below the site of the foreign body and dulness of the whole lower lobe on the spot where the decreased fremitus pectoralis has been noticed are observed. (*c*) When the foreign body lies in the bronchial stem for a longer time (from three weeks to several months), there is a diminished fremitus pectoralis in the lobes below the site of the foreign body, and an emphysematic sound on percussion in the lobes of the lung, below and above the foreign body. (*d*) On auscultation, in small children, the character of respiration is changed from the puerile to the vesicular with prolonged expiration. In older children and adults, breathing becomes weaker and the expiration is prolonged. When the foreign body lies in the bronchus for a long time, a prolonged expiration sets in, in the emphysematic area, above and below the foreign body.

4. If the foreign body lies in a bronchus for a long time (from about three weeks to several months), and if it changes its location, entering the other bronchus several hours or from one to two days before surgical intervention, the clinical picture can be observed in both lungs. All symptoms, especially the dulness, are more pronounced.

5. After the removal of the foreign body, the fremitus pectoralis becomes normal almost immediately. The dulness changes. The sound becomes clearer, but disappears after only one or two days. The character of the respiration also changes immediately.

AMBERG, Detroit.

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Regular Monthly Meeting, Nov. 5, 1928

EDWIN MCGINNIS, M.D., *President, Presiding*

THE AUDIOMETERS. DR. HORACE NEWHART (by invitation).

The development of the audiometer marks a new era in the progress of otology. Previous to its perfection otologists were handicapped by the lack of an accurate standardized method of testing and recording hearing acuity. This fact naturally retarded research, made uncertain the results of treatment and was responsible in a large measure for the small interest and poor attainment in the prevention of deafness and conservation of hearing on a large scale.

The otologist must acknowledge his large obligation to the physicist, especially to the telephone engineer, who in his need for an accurate, scientific and practical method for obtaining fundamental knowledge regarding the capacity and requirements of the ear in long distance telephone transmission, devised the audiometer as it is now known. Special mention in this connection should be made of the work of Dr. Harvey Fletcher and his associates of the Bell Telephone Laboratories and of Dr. E. P. Fowler. This invention in its various types as made available by the Western Electric Company has stimulated among otologists an interest in research. It has given to physicians, educators and social workers a renewed hope of being able to attack effectively the large problem of preventing unnecessary deafness. The stimulus for producing the audiometer for testing large groups has come in part from the deafened themselves as represented by their national organization, the American Federation of Organizations for the Hard of Hearing.

The audiometer specifically finds its greatest use along the following lines:

1. Research. In otology there are many unsolved problems in research regarding the incidence of loss of hearing, the causes of diseases of the ear and their relation to general systemic diseases. In these efforts the use, especially of the 1 *A* audiometer, with its wide ranges of pitch and intensity, promises worth while results.

2. In the clinical field, in the hands of the otologists, the smaller instrument, known as the 2 *A* audiometer, though of lesser range than the 1 *A*, is proving of the greatest usefulness in making possible greater accuracy and uniformity in testing and recording loss of hearing. It is a great saver of time, enables the otologist to follow the progress of his patients more thoroughly and makes possible the keeping of standardized records for the purpose of clinical comparison. The use of the audiogram is a distinct advantage in many cases in prescribing mechanical or electric aids for hearing.

3. In the educational world the audiometer is most useful in determining the proper classification of the case of the child who is hard of hearing as regards his need for specialized instruction.

4. In the industrial field the audiometer is of great value in detecting loss of hearing among employees in hazardous occupations, as in the operating department of railroads, where the safety of many depends on the hearing acuity of those in responsible positions. In this connection there is a wide use for the audiometer in testing all recruits for the army and navy. Life and accident insurance companies will soon appreciate the value of the audiometer in securing an accurate record of the acuity of hearing of all their larger risks.

During the developmental period of the 4 *A* audiometer, through the courtesy of Dr. Harvey Fletcher of the Bell Telephone Laboratories, an early model was placed at our disposal for research work in the Minneapolis Public Schools. The results were so eminently satisfactory that immediately on the release of the standard model with forty telephone outlets, the audiometer was adopted by the Board of Education of Minneapolis, the first city in America, I believe, in which this method was officially put into use. Our experience is based on the examination of more than 30,000 school children annually since September, 1926. The results fully justify the procedure and promise much as a health measure.

A partial tabulation of the tests thus far conducted shows an average of 8 per cent of all Minneapolis school children to have a loss of hearing of six sensation units or more in one or both ears. Seasonal variations are definitely noted, there being a greater incidence of loss of hearing during the latter half of the school year, the result of coincident or previous attacks of rhinitis and other infections of the upper respiratory tract. There is definitely a greater frequency of loss of hearing among younger children than those of more advanced years, among those who have had pathologic changes in the tonsils and adenoids, and among those in whose history there is definite evidence of defective hearing among the immediate relatives. Poor hygienic conditions in the home are also reflected by a greater frequency of impairments in hearing. Two and seventy-five hundredths per cent of those with impairment in hearing have a history of discharging ears, whereas among those with no loss of hearing or a loss of less than six sensation units there was noted an incidence of running ears amounting to only 0.3 per cent of those examined.

Dr. Warwick of Fort Worth, Texas, has recently shown that there is a decidedly greater incidence of loss of hearing among the colored people than among the whites.

5. One of the most important fields for the audiometer is in the prevention of deafness and the conservation of hearing through its wide application in the testing of large groups of school children to detect slight degrees of loss of hearing, the presence of which often indicates abnormal conditions which must be corrected to prevent more serious impairment. This principle has found wide acceptance, with the result that during the past two years the periodic examination of the hearing of school children by the multiple phonograph audiometer, 4 *A* instrument, and the individual, 3 *A* instrument, has been officially adopted in more than fifty American cities.

It is not to be expected that the audiometer will supplant the older methods of functional testing of the hearing apparatus. Notwithstanding the development of a satisfactory bone conduction receiver for use with the 1 *A* and 2 *A* audiometers, the tuning forks will continue to be necessary for qualitative tests and for differential diagnosis. The greater accuracy of the audiometer for quantitative tests, especially in dealing with slight degrees of impairment in hearing and the advantage of greater speed, standardization and economy, make the audiometer a most valuable, in fact an indispensable, supplement to the armamentarium of the otologist. The results of quantitative tests by the watch, whisper and tuning forks are convertible into terms of sensation units, the standard units of the audiometric system. When so converted, the results of the various tests, when made under favorable conditions, correspond closely.

So great has been the interest in the newer methods of testing the hearing aroused among the laity through widespread publicity that there is danger that they already have outstripped the general practitioner in their interest in and knowledge of the possible application of the audiometer. They are expecting its use by the otologist and are demanding its employment in the testing of school children. There is danger that the medical man, if he is too conservative in his attitude toward the movement for prevention of deafness, will be regarded as disinterested or not up to date. Our textbooks and teaching of the general practitioner need speedy modernization in the lines of prevention of deafness and the

conservation of hearing. The medical man should exercise a leadership whenever he can in the movement for better hearing, which is distinctly a health problem. If he fails to do so, he may be misjudged, and leadership in these activities may fall into less worthy hands.

THE TUNING FORKS AND OTHER TESTS. DR. ROBERT SONNENSCHEIN.

The purpose of functional testing of hearing is to determine whether a defect is present, the degree of the impairment, and the location of the lesion; that is, whether the conduction apparatus, consisting of the external ear, the middle ear and the eustachian tube, is involved, or whether the fault lies in the perception apparatus, which consists of the inner ear and auditory nerve. Before resorting to any of the detailed tests, one can get a considerable idea regarding the state of the patient's hearing by the general attitude, his apparent lip reading, the placing of the hand to one ear, thus improving the collection of sound waves, and the varying loudness of the voice. When bone conduction is greatly increased, the patient's voice sounds loud to himself, and he speaks very low; vice versa, when the bone conduction is diminished, the patient's voice sounds very low to himself, and he therefore speaks very loud. The pocket watch, the acoumeter and the voice are used in making the tests. The watch and acoumeter produce noises and are not dependable for accurate testing. The voice contains both noises and tones, and while it is not possible to standardize it definitely, if care is used, it is most valuable for determining in a practical way the subject's hearing efficiency. One should endeavor to use the same intensity each time by employing the residual air, with the patient standing at the farther part of the room with no part of the body touching the wall, the opposite ear occluded with the moistened finger, and the eyes closed or averted from the speaker. The examiner should approach the patient from a distance, noting at which point both low and high pitched sounds are heard. The tuning forks are most valuable for testing as they produce pure tones and can be had in pitches ranging from *C* 2 (16 double vibrations) to *C* 5 (4,096 double vibrations). In striking the forks, it should be remembered that the lower the pitch of the forks, the softer should be the object used for exciting them.

The principal tests are the Weber, Schwabach and Rinne. The Weber is used for determining whether lateralization is present, by placing the fork in the median line of the vertex. In normal subjects there is no lateralization of sound. In cases in which there is impairment of the middle ear or conduction apparatus, lateralization is usually to the worse ear; with lesions of the inner ear, it is usually to the better ear. There are many exceptions to this rule, and thus the Weber is the least reliable of the major tuning fork tests. If, however, the Weber test shows lateralization to the worse side in an infection of the middle ear and there is suddenly a change in lateralization to the ear with the better hearing, an extension of the infection to the inner ear of the affected side is usually indicated, so that the Weber test then gives most important information.

The Schwabach test determines the bone conduction in the individual compared with a normal living or an objective standard. A slight diminution or a slight increase in bone conduction is of no significance, but a markedly increased bone conduction usually means involvement of the conduction apparatus, and a decidedly shortened bone conduction usually indicates involvement of the perception apparatus. Bone conduction, however, is affected by many factors, such as age, thickness of the skull, adhesions of the dura to the bone and similar conditions.

The Rinne test serves as a comparison of the air with the bone conduction in the same subject. In normal cases the Rinne test is positive, namely, the sound is heard longer by air conduction than by bone conduction; whenever bone conduction is longer than air, the Rinne test is negative. After the tuning fork stem is no longer heard when applied to the region of the mastoid antrum, the sound will still be heard by air conduction in the subject with a normal positive Rinne test. When air conduction is longer than bone conduction, but both factors are shorter than normal, there is a positive Rinne test, but the result indicates a lesion of the inner ear. There are also a number of varieties of the negative

Rinne test depending on whether the bone conduction is greatly lengthened or shortened. A negative Rinne test usually means an impairment of the conduction apparatus, but when both air and bone conduction are much shorter than normal, even though bone conduction is still longer than air, the result usually means a combination of disease of both the inner and the middle ear. If with an "infinitely negative" Rinne test there is no hearing by air, but slight hearing by bone, it usually means that the ear under examination is practically deaf and that the hearing by bone is by diagonal resonance and is really heard in the opposite or normal ear.

The upper and lower tone limits are important factors. The lower tone limit is usually raised in diseases of the conduction apparatus, and a lowering of the upper tone limit is the first sign of a lesion of the inner ear. Later when the inner ear is more involved, the hearing for all tones, high, medium and low, is diminished. The upper tone limit is placed at about 20,000 double vibrations and is tested either with whistles, such as the Edelmann-Galton or the Schaefer-Galton, or better still, with the monochord. With the latter instrument it is possible to test the hearing for the highest tones by both air and bone conduction. The audiometer is a useful instrument in many ways, but with the type usually employed in office practice, the lowest tones as well as the highest tones cannot be tested. While it is difficult if not impossible to test bone conduction with the audiometer, this can be done easily with tuning forks.

The newest development is the manufacture of tuning forks of magnesium alloy, consisting of magnesium 95.6 per cent, manganese 0.4 per cent and aluminum 4 per cent. These forks are being manufactured at Riverbank Laboratory at Geneva, Ill., by Mr. N. E. Eisenhour. The advantage of these forks lies in the fact that they are rust-proof and have a specific gravity about one third that of steel, making it convenient to hold and manipulate them. When forks are not nickeled, they tend to rust unless they are properly handled and oiled. If they are nickeled, they sooner or later peel, and the vibration of the loose pieces of metal causes adventitious sounds.

Tuning fork and other tests are adjuncts in the making of a diagnosis of hearing defects. A careful examination of the patient including ears, nose, nasopharynx and pharynx is extremely important. The correlation of all of the facts obtained by history, examination and functional testing of hearing gives one the diagnosis and permits the formation of the prognosis and the outlining of treatment.

Rarely do operations on the nose have any effect on the hearing. Obstructions on one or the other side of the nose have practically no effect on the hearing. Interference with proper aeration of the eustachian tube by marked hypertrophy of the posterior end of the inferior turbinates or the presence of adenoids in the nasopharynx may have a decided effect on the eustachian tube and produce impairment of hearing of the conduction type. Likewise, infections of the nasal accessory sinuses with drainage of pus into the nasopharynx may also lead to involvement of the mechanism of the middle ear. The removal of septal spurs, deviation, etc., is of no value so far as relief from defects of hearing is concerned.

DISCUSSION

DR. GEORGE E. SHAMBAUGH: The functional tests of hearing which are of assistance to the practicing otologist are relatively simple and few. What exactly are the points about which the clinician wishes to have information? First, he wants to know whether a defect in hearing exists. Patients may present themselves with the symptom of tinnitus aurium but with the belief that they have no loss in the function of hearing. To ascertain whether there is a defect in hearing the whispered voice is usually satisfactory. We may add to this the test with the tuning forks for the lower tone range and with the Galton whistle for the upper tone range. It is sometimes desirable to know the exact measure of the loss of hearing. This is not of great moment, as a rule, but it may be desirable to have as accurate a record as possible of the status of the patient's hearing for comparison in determining whether the condition is progressing, and also at certain times to ascertain whether treatment that is instituted is relieving the defect. This measurement of the acuity of hearing can hardly be carried out successfully

with tuning forks. It can be ascertained with considerable accuracy by the use of the whispered voice, more accurately perhaps than one might suspect even in the noisy downtown district by observing the simple rule of having a patient always stand in the same place in the same room with the street window closed. The examiner acquires considerable skill in pitching his voice the same in making these tests. It would seem, however, that the audiometer should be a more satisfactory means for making an accurate estimation of the exact status of the hearing. This presupposes that that acoustic properties of the room in which the tests are being made are practically the same from day to day. A sound proof room is not needed for this purpose, because one is not trying to find out whether the patient has normal hearing. I made a series of tests some time ago of an associate in my office who has normal hearing, making an audiogram every day for a couple of weeks, and found the variation so slight from day to day as to be negligible.

Another fact which the otologist desires to ascertain from functional tests is an estimation of the handicap which a patient suffers because of an injury to the hearing in medicolegal cases. The handicap is expressed in terms of deafness for the voice, and the audiometer cannot give an estimation of the percentage of loss of hearing that is of any practical assistance in determining this handicap. Still another problem which the practicing otologist wishes to determine is whether the patient has suffered a complete loss of hearing in one ear with the hearing in the other ear still intact. This has become a more important consideration in recent years because of its bearing on the clinical problem associated with labyrinthitis secondary to an otitis media. It is no simple problem to determine by functional tests whether there is any remnant of hearing in one ear with the other ear still hearing. An experienced otologist, however, has often no difficulty in satisfying himself that there is a total loss of hearing, particularly in cases of injury. Fractures at the base of the skull which wipe out the function of the vestibular mechanism are expected to destroy the function of hearing as completely. Without a history of accident of this sort the problem of determining unilateral total deafness is clinically a difficult one.

Bezold, with his series of tuning forks and whistles for testing the entire range, undertook to make a diagnosis of total deafness by testing a patient in whom he was certain one labyrinth had been destroyed and took this as a chart for comparing the results of an examination in a patient suspected of having total monaural deafness. This is more or less the method of procedure which has been usually employed for establishing the diagnosis of total monaural deafness. It occurred to me that the audiometer would be a much more suitable device than the more cumbersome Bezold series of forks with their lack of accurate measurements, and a couple of years ago I published a series of audiograms of patients who suffered from total monaural deafness. The method, however, is not so useful as the ordinary methods for determining this fact. I wish to call attention to the fact that for practical purposes it is desirable to find out whether there is a defect in either end of the tone range. A defect at the upper end of the tone range is ascertained with surprising accuracy by using the whispered voice, utilizing such numbers as 66 and 67. A defect that can hardly be found with the Galton whistle can be ascertained in this way. The monochord appears to be of considerable use in testing the upper tone range, and I have found the audiometer of some assistance. It is different in the matter of testing defects in the lower tone range. Such defects can usually be picked up rather quickly by the whispered voice, but here the tuning forks are of particular value because the sound is not heard in the opposite ear, and the tests can all be made by air conduction. The audiometer is not satisfactory for testing the lower tone range, because a defect in the lower tone range is usually associated with increased bone conduction, and in using a telephone receiver for testing with the audiometer, bone conduction is a factor, as is evidenced by the fact that a person suffering from obstructive deafness always hears over the phone with remarkable clearness. A person with a less degree of deafness due to disease of the internal ear, bone conduction being diminished, experiences great difficulty in hearing over the telephone.

The important clinical problem for the otologist is that of determining where the alteration is located which is producing the defect in hearing; that is, whether the defect is one of obstruction to sound conduction or whether it is due to a defect in sound perception. To make this diagnosis, hearing tests are made which include bone conduction as well as air conduction. The tests for bone conduction are the Weber, Schwabach and the Rinne. I should like to point out a few of the outstanding shortcomings of each one of these tests. The Weber is logically the ideal test in monaural deafness. It should be lateralized to the better hearing ear in nerve deafness for obvious reasons and for less easily understood reasons to the poorer hearing ear in conduction deafness. Most patients with monaural deafness have no definite lateralization for the tuning fork. The Schwabach test has definite limitations. When one ear alone is affected, the Schwabach gives a clue as to its cause only when the deafness is due to obstruction, because then one may get prolonged bone conduction. When the one ear is involved in a nerve lesion with the other ear normal, the Schwabach test gives no assistance because the bone conduction is unimpaired. The Rinne also has definite limitations. In unilateral deafness when the defect is at all marked, the Rinne is negative, irrespective of where the lesion is located. I have never been satisfied that I could make a diagnosis of a type of obstruction deafness by the Rinne test as indicated in Dr. Sonnenschein's remarks. Incipient fixation of the stapes will give first a short end positive, then a plus and minus, then a slight negative and finally, as the condition progresses, a profound negative or absolute negative Rinne. Exactly these same reactions will be produced by alterations in the tympanum. What is determined is the fact that there is obstructive deafness and something about the degree of the obstruction, but there is nothing specific regarding the type of condition causing obstruction. The audiometer offers the best means for testing the acuity of hearing in the midst of the tone range, for in addition to the elevation of the lower tone range, diseases of the internal ear are prone to produce defects in the midst of the tone range. Bezold pointed this out in connection with otosclerosis and referred to them as gaps, believing that there was no hearing in these gaps. These he detected by means of his tone series forks and whistles. By the Western Electric Audiometer it can be easily demonstrated that these are not actual gaps but depressions in the hearing.

The audiometer supplies an interesting adjunct to the functional tests which the clinician requires, but that it is not an important adjunct and in no sense supplants the other functional tests. Its chief value is as a research instrument, for those who are interested in the problem of sound perception independent of any practical assistance one gets from making tests. An audiometer is a useful instrument in an institution in which otology is being taught. It helps the students to visualize facts that are not easy for them to grasp otherwise.

DR. J. HOLINGER: One must differentiate between two forms of hearing tests. The audiometer gives a functional test showing whether the hearing is normal, and if subnormal what the percentage of the loss is from the normal for the different pitch. Bezold's tests are diagnostic so far as they help to locate the cause of the loss of hearing, either in the middle ear or in the inner ear. Bezold measures the hearing by air conduction and hearing by bone conduction, and compares hearing by air conduction with hearing by bone conduction after having ascertained their relations in the normal ear. Rinne's test compares hearing by air conduction with hearing by bone conduction in the same ear. The Weber-Schwabach test compares hearing by bone conduction of one ear with that of the other ear and with that of the examiner, who previously has gaged his own bone conduction by comparing it with that of many other normal subjects. This analysis or measurement puts one in a position to say whether the interference with hearing is located in the middle ear or in the inner ear, including the acoustic nerve and its central parts. Siebenmann showed by several hundred postmortem examinations that the conclusions which are drawn from such measurements are correct. The theory of how normal hearing by bone conduction occurs and the theories of how the pathologic changes in the middle ear or in the inner ear affect the hearing by bone conduction are irrelevant, but the technic of the measurements must be minutely followed if the result is to be of any value. I considered the book

by Professor Schittler on the fundamental tests of the ear of great assistance in answering many questions and eliminating uncertainties.

I should like to call attention to the statement of Bezold that the pitch of speech extends over the whole audible sound scale, from the lowest pitch to the highest. Therefore, speech, whispered as well as loud, is an adequate, convenient and inexpensive instrument for testing hearing. The range from b^{I} to g^{II} is important only for hearing tests of deafmutes, for if a deafmute hears the tuning forks from b^{I} to g^{II} 10 per cent of the normal length of time, this hearing may be used as adjuvant to teaching him to hear speech, together with lip reading.

As to nasal operations on patients suffering from otosclerosis, many of these unfortunates claim that each nasal infection makes them worse and that they do not return to as favorable a condition after the infection clears up. If the tendency to recurrent colds can be eliminated by correcting the deviation of a septum or a hypertrophic lower turbinal, something can be accomplished for these patients that is well worth while.

Dr. G. Henry Mundt: Referring to the routine examination of railway men, the medical section of the American Railway Association has not been as keen as they should have been in determining the hearing ability of the men employed. One of the large systems estimated the hearing at 20/20 if the subject examined heard spoken voice at a distance of 20 feet. This should put medical men on the alert to discover defects in hearing, and it is possible to test large groups by means of an audiometer. If defective hearing is considered an important factor in disqualifying men for driving motor cars, it should certainly hold true also in railway work, and there is no other method that can be placed in the hands of a large group of examiners aside from the audiometer. All otologists should be interested in the audiometer in testing men in industry. I believe it is certain to come into general use, and physicians should interest themselves in having the apparatus demonstrated to groups of physicians. The medical profession will have to investigate and standardize the examination of men who are going to operate motor cars, and if hearing defects have a tendency to disqualify a man for such a position, some method should be determined which can be recommended for such examinations.

Dr. Joseph C. Beck: I have used the audiometer from the beginning, comparing those results with the results obtained from the tuning forks and other methods of testing hearing. I have not found it easy to get away from the older methods, and still insist that they be used as a check-up in all cases. I agree with Dr. Mundt that the medical profession should investigate and determine the clinical value of the test by applying it, for it is a source of great interest in the literature of this country and Europe. All the truth should be brought out regarding the test, but brought out in the right way. Not enough men have used the apparatus to permit one to talk of finalities in the audiometer test, and it is a useful adjunct to the hearing tests, especially when a large number of subjects are to be examined.

Dr. A. A. Hayden: I should like to ask Dr. Shambaugh how he diagnosed otosclerosis with the audiometer, and how for comparison he diagnosed it with the tuning fork. I also would like to know whether he thought an air cushion placed over the receiver on either instrument would lessen the question of bone conduction.

The remarks of Dr. Mundt and Dr. Beck are indeed timely, for the economic importance of this subject to the public as well as to the otologist and the deafened subject is of great concern. I do not see how hearing tests could become a part of routine periodic health examination unless some such device as the audiometer, both the 2 *A* and 4 *A*, could be used. If it is necessary to make a test of several hundred persons, the 4 *A* audiometer offers the only logical method and is the only means by which the hearing of large groups can be examined. If defects in hearing are discovered, those persons can be subjected to more critical and painstaking tests.

I was glad to hear Dr. Schambaugh say that the human voice is an accurate means of testing hearing acuity, and agree with him that an observer can easily form the habit of carrying out the tests in the same way, making a standardized test, if working under the same conditions all of the time, but this means nothing

to the men who might have occasion to examine the patient in years to come. The audiometer offers a universal method, which the other tests do not. The economic factor is of importance and will largely determine whether or not the apparatus will be adopted. A set of all necessary sizes of tuning forks, a monochord and a whistle can be procured for several hundred dollars less than an andiometer, but the time consumed in making a complete test with the tuning fork is much greater than that necessary with the other apparatus. If the audiometer is used as an adjunct to the tests with the tuning fork, the time consumed can be reduced considerably.

DR. SHAMBAUGH: In reply to Dr. Hayden, I appreciate very much the contribution of the audiometer by the Western Electric Company, and his remarks were in no sense disparaging to the use of this instrument. His effort was to point out how it might be of use to the practicing otologist. As for making a diagnosis of otosclerosis on the basis of tests by the audiometer, this cannot be done. Even the diagnosis of obstructive deafness as distinguished from perceptive deafness cannot be made in many cases by the perusal of the audiogram. The finer points in diagnosis are dependent on the reactions of the tuning fork.

DR. WALTER H. THEOBALD: I should like to ask Dr. Newhart whether in the group examinations he differentiates between the right and the left ear. I also favor the use of the human whispered voice; it is of value in helping to group cases at the time of first examination as to whether the condition is due to nerve deafness or to interference in sound conduction.

In the demonstration that was made of the audiometer I was interested in the fact that the record of the male voice made use of three numerals, 6-1-6, using two high tones and one low tone. I should like to know whether or not there is a chance for error in estimating the child's percentage of hearing since only the high tones might be heard and not the low ones, or vice versa.

DR. EDWIN MCGINNIS: I was much interested in Dr. Sonnenschein's remarks. In patients with nasal obstruction I find that almost without exception the ear on the obstructed side is involved. I agree that it is not the deflection of the septum that causes the impairment in hearing, but believe that the infection that nearly always accompanies it is probably accountable for the defect.

DR. HORACE NEWHART: I wish to thank Mr. Barland and his associates of the Graybar Electric Company who demonstrated the audiometers and Dr. Shambaugh and the others for their considerable discussion of my paper. The 3*A* and 4*A* audiometers as employed in public school work are not, like the 1*A* and 2*A* instruments, to be regarded as instruments of precision, but, because of their vastly greater accuracy and the case and speed with which they can be used in testing large groups, they present a great advantage over the old methods. The whispered voice and tuning fork tests, however, should not be discarded, but the audiometer must be regarded as a most valuable addition to the armamentarium by which the medical profession can make further progress, particularly in the field of research and in the prevention of deafness. Improvements will doubtless be made that will still further enhance its usefulness.

In correction of deflected septums, and in the clearing up of nasal infections and sinus infections by giving better ventilation and drainage, there is a large field for endonasal surgery when applied with intelligence and proper conservatism.

Replying to the question of Dr. Theobald, it was stated that in the experimental school tests comparison was made between the right and the left ear for a time, but it was found of no practical value. After attempting an early survey of about 1,000 children with the watch tick and whispered voice test, the old method was quickly abandoned because of the great amount of time consumed and the unsatisfactory results caused by the many disturbing factors, when, through the courtesy of the Western Electric Company, an early model of the 4*A* audiometer was placed at our disposal. The advantage of the audiometer in the great saving of time, and the greater delicacy and accuracy of the test were strikingly apparent. No attempt has been made in tabulating the records to distinguish between perception of the sibilant sounds and the other sounds of the voice.

The phonographic test records have already been made in the French language and are soon to be produced in the German. At the First International Oto-laryngological Congress in Copenhagen, where I presented a paper on the use of the audiometer in public school work and demonstrated the instruments, the interest and approval in this distinctly American method were most gratifying.

DR. SONNENSCHEIN: The reason so many persons hear better over the telephone than otherwise is that by bringing the receiver close to the ear the intensity of the sound is greatly increased. Infection in the nose may affect the eustachian tube and have some effect on the hearing in that way.

With reference to using the audiometer in testing railroad and other employees and for testing groups in general, the necessary tuning forks could be procured much more cheaply, and the results obtained would be more accurate if the "constant" of decrement is used. The cost of the audiometer is a factor, and with the *2 A* type, one cannot test below 64 vibrations, but with the tuning forks this can be done and the results are just as accurate. It is nice to have the audiometers, but many things can be accomplished with the tuning forks and voice that cannot be done with the audiometers.

COLLEGE OF PHYSICIANS OF PHILADELPHIA, SECTION ON OTOLOGY AND LARYNGOLOGY

H. P. SCHENCK, M.D., *Reporter*

Regular Meeting, Jan. 16, 1929

GEORGE M. COATES, M.D., *Chairman*

BRONCHOSCOPY AND DISEASE; A BRIEF RÉSUMÉ. DR. CHEVALIER JACKSON.

Dr. Chevalier Jackson gave a résumé of cases observed in the bronchoscopic clinics of Philadelphia during the four months ending Dec. 31, 1928. Of the total number of cases (6,938), 4,339 were consultations, 353 direct laryngoscopy, 1,643 bronchoscopy, 10 tracheotomy and 391 esophagoscopy.

During the four months ending Dec. 31, 1923, there were 445 total cases received for examination, 88 per cent of the cases for disease and fifty-one cases for foreign body; while, during the last four months of 1928, only 112 patients with the presence of a foreign body (2 per cent of the total) were treated, and 6,826 cases were referred because of disease. Treatment in cases in which a foreign body was present was successful in from 98 to 99 per cent of the patients.

Details of a case of pulmonary suppuration were presented, showing how aspiration of the pus was followed by recovery. Dr. Jackson predicted that in twenty-five years persons with any kind of pulmonary disease will be treated by means of the bronchoscope.

LARYNGEAL STENOSIS, WITH SPECIAL REFERENCE TO METHODS OF TREATMENT AND RESULTS. DR. GABRIEL TUCKER.

Following a brief discussion of stenosis and its treatment, Dr. Tucker exhibited slides of a number of cases in which the patients had required dilation with various sizes of dilators by the direct method. The method of dilation by means of plugs was described. When other methods fail, laryngoscopy can be done, the cicatricial tissue being excised and dilators used. The use of laryngoscopic instruments, and the results of such treatment were illustrated by lantern slides.

TUBERCULOSIS OF THE BRONCHIAL WALL. DR. LOUIS CLERF.

Dr. Clerf pointed out that bronchoscopy is rarely justified in a known case of tuberculosis but might occasionally be indicated in the treatment of cicatricial

stenosis, secondary to a healed perichondritis or suppurating peritracheobronchial lymphadenitis of tuberculous origin.

A man, aged 32, was presented, with a condition beginning with acute coryza and an unproductive cough, and developing into fever and wheezing. The patient could lie only on the right side. The physical signs were inexplicable. By roentgen examination, the right diaphragm appeared always higher than the left, and the left lung changed little during the breathing cycle. There was a definite increase in the size and density of the root shadows at the root of the left lung. The history had no bearing on the symptoms. There had been no hemoptysis, and the sputum was negative for tubercle bacilli. Results of the Wassermann and Kahn tests were negative.

At bronchoscopy, the orifice of the left bronchus was normal, but at a point 2 cm. beyond the carina there was observed an area of superficial erosions of the mucosa, covered with a grayish exudate, involving the outer wall and extending along the anterior and posterior walls; this extended downward along the bronchial wall, and, at the orifice of the bronchus of the upper lobe of the lung, small, flat, pale fungations which partially occluded its lumen were found; the mucosa of the bronchus of the lower lobe of the lung was infiltrated throughout its entire extent, and, at a point about 1 cm. beyond the orifice of the upper lobe, the bronchus of the lower lobe was occluded by inflammatory tissue, so that its lumen existed as a mere slit with its long axis lying in the coronal plane. A specimen of secretion and a small fragment of tissue were found to contain the human strain of tubercle bacilli. No attempt was made to carry out topical applications, and bronchoscopic dilation was not practiced.

Posttonsillectomic Abscess of the Lung. Bronchoscopy in Diagnosis and Treatment. Dr. Robert M. Lukens.

In reviewing the literature, Dr. Lukens pointed out that Dr. Clerf had found the greatest number of cases (39 per cent) in patients between the ages of 20 and 30 years, as compared with 10 per cent in children 10 years of age or under. He discussed the relative importance of the choice of anesthesia, position of the patient during operation and age.

Pulmonary abscesses should be suspected in every case of pulmonary symptoms following tonsillectomy. Diagnostic bronchoscopy reveals the exact lobe in which abscesses are located, and in the case of abscesses of the lower lobe of the lung the location can be narrowed down to the area drained by a subdivision of the bronchus of the lower lobe. The possibility of peroral drainage can also be determined at this time.

The case presented illustrated the fact that a foreign body, such as bone too thin to be opaque to x-rays, may be the obstruction even in a case of pulmonary abscess following tonsillectomy. The patient in this instance had inhaled a small piece of bone when an intranasal operation was performed at the same time as tonsillectomy.

Hysterical Aphonia. Disappearance Following a Diagnostic Bronchoscopy. Dr. William F. Moore.

Dr. Moore presented the case of a women, aged 35, in whom there was a history of periodic loss of voice over a period of six years. The attack usually followed exposure to cold or getting the feet wet. The cords were thickened but came together on coughing. The case was followed over a period of five months during which local medication and electrical stimulation were tried without result. Because of the lack of improvement and the patient's sense of constriction, diagnostic bronchoscopy was performed. Results of bronchoscopy were negative, but the next day the patient had lost all symptoms.

The majority of cases reported have been in women of the neurotic type during the menstrual life. There may be a functional adductor paresis which is usually complete; that this is functional is shown by the mobility of the cords during coughing or laughing. The usual signs of an acute laryngitis are not found.

THE AORTA IN RELATION TO ESOPHAGOSCOPY. DR. J. SANFORD MOYER.

Dr. Moyer reviewed the anatomic relations of the aorta to the esophagus. Esophagoscopy, with proper precautions, is without danger to the normal aorta. In disease, the dilated aorta is always in danger. Esophagoscopy is justifiable in a case when a foreign body is suspected, and with care can be done even in the presence of aneurysm. Three cases were presented, illustrating stenosis, the result of aneurysm, and stenosis not associated with aneurysm.

ASTHMATIC SYMPTOMS DUE TO GRANULOMAS OF BOTH MAIN BRONCHIAL ORIFICES COMPLICATED BY CICATRICIAL STENOSIS OF THE LEFT MAIN BRONCHUS. DISAPPEARANCE OF SYMPTOMS AFTER BRONCHOSCOPIC REMOVAL OF GRANULOMAS AND BRONCHOSCOPIC DILATATION OF STRICTURE. DR. EDMOND AUCOIN.

Dr. Aucoin presented a woman, aged 39, in whom shortness of breath, wheezing respiration, paroxysmal cough, intermittent expectoration of pus (at times blood-streaked), loss of weight and extreme nervousness were the prominent symptoms. Beginning ten years before coming under observation, the symptoms had become progressively worse. For four years the patient had been treated for bronchial asthma and later for tuberculosis. No acid-fast organisms were ever found. Physical and roentgen examinations were absolutely inconclusive.

On bronchoscopy, a large pedunculated mass in the right main bronchial orifice was found to move up and down with the bronchial movements. Fungations sprang from the outer and posterior wall opposite the carina and partially occluded the left main bronchial orifice. Following the removal of the pedunculated mass, the patient could breathe freely and feel air go in and out on the right side. Results of laboratory studies on the secretions and tissue were negative for tuberculosis, and spirochetal and parasitic infections. Histologic examination revealed only lesions of a chronic inflammatory character.

Two bronchoscopies were sufficient to clear up the granulomatous condition, which had not recurred a year later, and even during and after an acute infection of the upper respiratory tract, there was no recurrence of coughing, wheezing or dyspnea.

BONES AS OVERLOOKED FOREIGN BODIES IN THE LUNG. DR. C. L. JACKSON.

Dr. Jackson pointed out that bones represented 13 per cent of the collection of foreign bodies brought together by Dr. Chevalier Jackson. Of these, 15 per cent had been retrieved from the air passages and 85 per cent from the food passages. Ten per cent of foreign bodies are overlooked, and 20 per cent of the bone specimens were in the overlooked class.

A number of cases were discussed, and lantern slides of the roentgen plates and specimens were shown. In eight typical cases in which the presence of bone in the lung was overlooked, only two showed the foreign body in the x-ray pictures, and two cases had a completely negative history. In another case, a year after the patient had choked while eating squirrel, an abscess developed in the lower lobe of the left lung and there was obstruction of the left bronchus. X-rays did not show a foreign body, but, at bronchoscopy, Dr. Tucker removed three vertebrae of the squirrel.

The possibility of the presence of a foreign body should be considered in all cases of chronic pulmonary disease, with or without a suspicious history, and whether or not x-rays show the foreign body.

LANTERN SLIDE AND MOVING PICTURE DEMONSTRATION OF THE JACKSON TECHNIC OF BRONSCHOSCOPIC ASPIRATION.

The films, taken at the Bronchoscopic Clinic of the University Hospital, showed the details of routine bronchoscopic aspiration as carried out on patients in the outpatient department. The rapidity of the procedure and the indifference of the patients to the operation, both before and after treatment, were noteworthy.

Directory of Otolaryngologic and Ophthalmologic Societies *

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SECTION ON LARYNGOLOGY, OTOLOGY AND RHINOLOGY

Chairman: Dr. William V. Mullin, Cleveland Clinic, Cleveland.
Secretary: Dr. Gabriel Tucker, Bronchoscopic Clinic, University Hospital, Philadelphia.
Place: Portland, Ore. Time: July 8-12, 1929.

AMERICAN BRONCHOSCOPIC SOCIETY

President: Dr. C. J. Imperatori, 17 E. 38th St., New York.
Secretary-Treasurer: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia.

AMERICAN LARYNGOLOGICAL ASSOCIATION

President: Dr. Charles W. Richardson, 1337 Connecticut Ave. N. W., Washington, D. C.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Place: Atlantic City, N. J. Time: May 20-22, 1929.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Hill Hastings, 1136 W. 6th St., Los Angeles.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.
Place: San Francisco. Time: July 4-6, 1929.

AMERICAN OTOLOGICAL SOCIETY

President: Dr. J. Gordon Wilson, 104 S. Michigan Ave., Chicago.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Harris P. Mosher, 828 Beacon St., Boston.
President-Elect: Dr. William H. Wilder, 122 S. Michigan Ave., Chicago.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.
Place: Atlantic City, N. J.

LOCAL

SECTION OF OPHTHALMOLOGY AND OTOLARYNGOLOGY OF THE LOS ANGELES COUNTY MEDICAL SOCIETY

President: Dr. Harold S. Muckleston, 6422 Hollywood Blvd., Los Angeles.
Secretary-Treasurer: Dr. J. Frank Friesen, 1208 Roosevelt Bldg., Los Angeles.

THE COLORADO OTO-LARYNGOLOGICAL SOCIETY

President: Major Royal Reynolds, Fitzsimons General Hospital, Aurora.
Secretary: Dr. Rex L. Murphy, Metropolitan Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg. Time: First Saturday of each month from October to May.

* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

Section on Ophthalmology and Oto-Laryngology of the Medical Society of the District of Columbia

Chairman: Dr. Walter A. Wells, 1606, 20th St. N. W., Washington.
Secretary: Dr. J. N. Greear, Jr., 1740 M St. N. W., Washington.
Place: 1718 M St. N. W. Time: 8 p. m., third Friday of each month.

Atlanta Academy of Ophthalmology and Otolaryngology

President: Dr. Arthur J. Fort, Medical Arts Bldg., Atlanta, Ga.
Secretary: Dr. Leon E. Brawner, 157 Forrest Ave. N. E., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

Chicago Laryngological and Otological Society

President: Dr. Edwin McGinnis, 104 S. Michigan Ave., Chicago.
Secretary-Treasurer: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Grill Room, Stevens Restaurant, 16 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. Lafayette Page, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

New Orleans Ophthalmological and Otological Society

President: Dr. M. Earle Brown, Maison Blanche Bldg., New Orleans.
Secretary-Treasurer: Dr. W. A. Wagner, Pere Marquette Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital, New Orleans. Time: 8 p. m., third Thursday of each month from September to June.

Section on Otology and Laryngology of the Baltimore City Medical Society

Chairman: Dr. Waitman F. Zinn, Medical Arts Bldg., Baltimore.
Secretary: Dr. Moses L. Breitstein, 1212 Eutaw Pl., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

Detroit Oto-Laryngological Society

President: Dr. William Fowler, 1048 Maccabees Bldg., Detroit.
Secretary-Treasurer: Dr. Don A. Cohoe, 13535 Woodward Ave., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

The Kansas City Eye, Ear, Nose and Throat Society

President: Dr. T. S. Blakesley, Lathrop Bldg., Kansas City, Mo.
Secretary: Dr. A. E. Eubank, Argyle Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

New England Otological and Laryngological Society

President: Dr. Francis P. Emerson, 520 Commonwealth Ave., Boston.
Secretary-Treasurer: Dr. Charles T. Porter, 520 Commonwealth Ave., Boston.

Academy of Medicine of Northern New Jersey, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Lee W. Hughes, 1019 Broad St., Newark.
Secretary: Dr. Earle LeRoy Wood, 31 Lincoln Park, Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

THE SECTION OF LARYNGOLOGY AND RHINOLOGY OF THE NEW YORK ACADEMY OF MEDICINE

Chairman: Dr. David H. Jones, 114 E. 54th St., New York.
Secretary: Dr. Edward Frankel, Jr., 152 W. 58th St., New York.
Place: 103d St. and 5th Ave. Time: 8:30 p. m., fourth Wednesday of each month from October to May.

THE OTOLOGICAL SECTION OF THE NEW YORK ACADEMY OF MEDICINE

Chairman: Dr. Clarence H. Smith, 2 E. 54th St., New York.
Secretary: Dr. James Garfield Dwyer, 57 W. 57th St., New York.
Place: 103d St. and 5th Ave. Time: Second Friday of each month from October to May.

EASTERN NEW YORK EYE, EAR, NOSE AND THROAT ASSOCIATION

President: Dr. M. S. Lord, 148 Barrett St., Schenectady.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.

ROCHESTER EYE, EAR, NOSE AND THROAT SOCIETY

Chairman: Dr. Frank Barber, 75 S. Fitzhugh St., Rochester, N. Y.
Secretary-Treasurer: Dr. Cecil B. Hert, 29 N. Goodman St., Rochester, N. Y.
Place: Rochester Medical Association, 13 Prince St. Time: 8 p. m., third Monday of each month from October to May.

CINCINNATI OTO-LARYNGOLOGICAL SOCIETY

President: Dr. C. C. Jones, Doctors Bldg., Cincinnati.
President-Elect: Dr. Harris H. Vail, 24 E. 8th St., Cincinnati.
Secretary-Treasurer: Dr. M. F. McCarthy, 2600 Union Central Bldg., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

THE OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SECTION OF THE CLEVELAND ACADEMY OF MEDICINE

Chairman: Dr. A. B. Brunner, Guardian Bldg., Cleveland.
Secretary: Dr. A. L. Stotter, 1148 Euclid Ave., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

President: Dr. Robert R. Hampton, Boston Bldg., Salt Lake City.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.
Place: Salt Lake City. Time: July 1-3, 1929.

PHILADELPHIA LARYNGOLOGICAL SOCIETY

President: Dr. Henry A. Laessle, 13th and Spruce Sts., Philadelphia.
Secretary: Dr. Herman B. Cohen, 13th and Spruce Sts., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., first Tuesday of each month from October to June.

THE SECTION ON OTOLOGY AND LARYNGOLOGY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

Chairman: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Clerk: Dr. Frederick M. Strouse, 13th and Spruce Sts., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., third Wednesday of each month from October to June.

The Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

Dallas Academy of Ophthalmology and Otolaryngology

President: Dr. John G. McLaurin, Medical Arts Bldg., Dallas, Texas.
Executive Secretary: Dr. W. Mood Knowles, Medical Arts Bldg., Dallas, Texas.
Recording Secretary: Dr. L. M. Sellers, Medical Arts Bldg., Dallas, Texas.
Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. C. P. Schenck, Medical Arts Bldg., Fort Worth, Texas.
Secretary-Treasurer: Dr. R. H. Needham, Fort Worth National Bank Bldg., Fort Worth, Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

Eye, Ear, Nose and Throat Section of the Houston Academy of Medicine

President: Dr. John H. Foster, 1300 Walker Ave., Houston, Texas.
Secretary: Dr. Edward W. Griffey, Houston Clinic, Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. F. H. Roseborough, 302 Moore Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. William D. Gill, 323 Medical Arts Bldg., San Antonio, Texas.
Place: Bexar County Medical Library, San Antonio. Time: 8 p. m., first Tuesday of each month from October to May.

The Milwaukee Oto-Ophthalmic Society

President: Dr. L. P. Allen, 145½ Main St., Oshkosh, Wis.
Secretary-Treasurer: Dr. Edward R. Ryan, 425 E. Water St., Milwaukee.
Pleace: University Club. Time: 6:30 p. m., third Tuesday of each month.

THE ARCHIVES OF OTOLARYNGOLOGY is published by the American Medical Association to stimulate research in the field of laryngology and otology, and to disseminate knowledge in this department of medicine.

Manuscripts for publication, books for review, and correspondence relating to the editorial management should be sent to Dr. George E. Shambaugh, Editor-in-Chief, 122 South Michigan Avenue, Chicago, or to any other member of the Editorial board. Communications regarding subscriptions, reprints, etc., should be addressed, ARCHIVES OF OTOLARYNGOLOGY, American Medical Association, 535 North Dearborn Street, Chicago.

Articles are accepted for publication on condition that they are contributed solely to the ARCHIVES OF OTOLARYNGOLOGY. Manuscripts must be typewritten, preferably double spaced, and the original copy should be submitted. Zinc etchings and halftones of illustrations will be supplied by the publisher when the original illustrations warrant.

Footnotes and bibliographies should conform to the style of the Quarterly Cumulative Index Medicus, published by the American Medical Association. This requires, in order given: name of author, title of article, name of periodical, with volume, page, month — day of month if weekly — and year. A complete list of abbreviations for standard periodicals, together with a full discussion of the style of the A. M. A. publications, appears in The Art and Practice of Medical Writing, a comprehensive book on the preparation of medical manuscripts, published by the American Medical Association. Price, $1.50.

Matter appearing in the ARCHIVES OF OTOLARYNGOLOGY is covered by copyright, but, as a rule, no objection will be made to its reproduction in reputable medical journals if proper credit is given. However, the reproduction for commercial purposes of articles appearing in the ARCHIVES OF OTOLARYNGOLOGY, or in any of the other publications issued by the Association, will not be permitted.

Authors will receive one hundred reprints free; additional reprints may be obtained at cost.

The ARCHIVES OF OTOLARYNGOLOGY is issued monthly. Annual subscription price (two volumes): Domestic, $6.00; Canadian, $6.40; foreign, $6.75, including postage. Single copies, 75 cents, postpaid.

Checks, etc., should be made payable to the AMERICAN MEDICAL ASSOCIATION.

OTHER PERIODICAL PUBLICATIONS
of the American Medical Association

THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION—Weekly. Covers all the medical sciences and matters of general medical interest. Illustrated. Annual subscription price (two volumes): Domestic, $5.00; Canadian, $6.50; foreign, $7.50. Single copies, 20 cents.

ARCHIVES OF INTERNAL MEDICINE—Monthly. Devoted to the publication of advanced, original clinical and laboratory investigations in internal medicine. Illustrated. Annual subscription price (two volumes): Domestic, $5.00; Canadian, $5.40; foreign, $5.75. Single copies, 75 cents.

AMERICAN JOURNAL OF DISEASES OF CHILDREN—Monthly. Presents pediatrics as a medical science and as a social problem. It includes carefully prepared collective abstracts based on recent pediatric literature, abstracts from foreign and domestic literature, book reviews, society transactions, etc. Illustrated. Annual subscription price (two volumes): Domestic, $5.00; Canadian, $5.40; foreign, $5.75. Single copies, 75 cents.

ARCHIVES OF DERMATOLOGY AND SYPHILOLOGY—Monthly. Devoted to advancing the knowledge of and progress in cutaneous diseases and syphilis. Publishes original contributions and full abstracts of the literature on these two subjects, transactions of the important dermatological societies, book reviews, etc. Illustrated. Annual subscription price (two volumes): Domestic, $8.00; Canadian, $8.40; foreign, $8.75. Single copies, 85 cents.

ARCHIVES OF NEUROLOGY AND PSYCHIATRY—Monthly. A medium for the presentation of original articles on nervous and mental diseases, with abstracts from foreign and domestic literature, book reviews, society transactions, etc. Illustrated. Annual subscription price (two volumes): Domestic, $8.00; Canadian, $8.40; foreign, $8.75. Single copies, 85 cents.

ARCHIVES OF SURGERY—Monthly. Devoted largely to the investigative and clinical phases of surgery, with monthly reviews on orthopedic and urologic surgery. Well illustrated. Annual subscription price (two volumes): Domestic, $8.00; Canadian, $8.40; foreign, $8.75. Single copies, 85 cents.

ARCHIVES OF PATHOLOGY—Monthly. A periodical devoted to the publication of original contributions in the field of pathology, with abstracts from foreign and domestic literature, book reviews, the transactions of special societies, etc. Illustrated. Annual subscription price (two volumes): Domestic, $6.00; Canadian, $6.40; foreign, $6.75 Single copies, 75 cents.

ARCHIVES OF OPHTHALMOLOGY—Monthly. Includes original articles on diseases of the eye, abstracts from foreign and domestic literature, book reviews, transactions of special societies, etc. Illustrated. Annual subscription price (two volumes): Domestic, $8.00; Canadian, $8.40; foreign, $8.75. Single copies, 85 cents.

QUARTERLY CUMULATIVE INDEX MEDICUS—Quarterly. A complete subject and author index to the worth-while current medical literature of the world. Issued four times a year. Second and fourth volumes bound for permanent reference. Subscription price, calendar year: Domestic, $12.00; Canadian, $12.50; foreign, $12.75.

AMERICAN MEDICAL ASSOCIATION

535 North Dearborn St. CHICAGO

CONTENTS

PAGE

Laryngeal Cancer: Early Diagnosis and Treatment. John Edmund Mackenty, M.D., New York 237

Roentgen Observations on Safety-Pins as Foreign Bodies. Willis F. Manges, M.D., Philadelphia 245

"Suction Mastoids." J. Coleman Scal, M.D., New York 251

Angina Agranulocytosis. John B. Potts, M.D., Omaha 256

Endoscopic Treatment of Pulsion Diverticulum: A Further Report. Charles J. Imperatori, M.D., New York 266

Congenital Atresia of the Esophagus with Tracheo-Esophageal Fistula. W. Likely Simpson, M.D., Memphis, Tenn 267

An Antro-Ethmosphenoidal Operation. Frederick Myles Turnbull, M.D., Los Angeles 271

Replacement of the Lower End of the Dislocated Septal Cartilage Versus Submucous Resection of the Dislocated End of the Septal Cartilage. Myron Metzenbaum, M.D., Cleveland 282

Osteoma of the Frontal Sinus. Jefferson Browder, M.D., Brooklyn 297

An Unusual Case Presenting Fourteen Upper Molar Teeth. George C. Saunders, M.D., and Gordon B. New, M.D., Rochester, Minn 307

Clinical Notes:

An Operating and Visualizing Sinuscope: Preliminary Report. Samuel Morse, M.D., New York 313

Modification of the Lichtwitz Antrum Trocar. George D. Wolf, M.D., New York 317

Progress in Otolaryngology. A Summary of the Bibliographic Material Available in the Field of Otolaryngology: Peroral Endoscopy. Louis H. Clerf, M.D., Philadelphia 318

Abstracts from Current Literature 343

Society Transactions:

Chicago Laryngological and Otological Society 352

College of Physicians of Philadelphia, Section on Otology and Laryngology 360

Directory of Otolaryngologic and Ophthalmologic Societies. 363